THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXIII. No. 819.] LONDON, JANUARY 21, 1879. [31st Year.] Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
Proprietors: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
Works: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNTS
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
FOR THE
ERECTION AND REBUILDING OF GAS AND WATER WORKS.
ESTIMATES FREE
FOR MAIN-LAYING AND GENERAL REPAIRS
RETORT-SETTING A SPÉCIALITÉ.
ROBUS'S IMPROVED RETORT-SETTINGS guaranteed to carbonize a large amount of coal with a small per cent. of fuel.
N.B.—All kinds of Fire Goods, &c., kept in stock for immediate delivery. Orders promptly attended to.
BELL GREEN, CATFORD, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES,
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

The want of gaslight, caused by the freezing of Wet Meters, is a very general source of complaint, and it is acknowledged that all attempts to remedy the evil have proved futile.

The want of gaslight, during the dark, foggy weather of mid-winter, when gas is most needful, is a source of great loss both to Gas Companies and the public. The convenience and economy of gaslight is so great, compared with any other artificial light, that there is no valid ground for believing that it can be supplanted, and, until coal becomes many times dearer than at present, it must remain the cheapest and most convenient source of light and heat. It is especially to be regretted when Gas Companies are making every exertion to remove all just grounds of complaint, and, as far as possible, to consult the public convenience, that the annoyance caused by smoky and unsteady flames, or the total extinction of the lights consequent on the freezing of wet meters, should induce the public to lend a ready ear to the fallacy of the electric light as a substitute for gas.

The destructive influence of the expansive force of water while freezing is familiarly known in the bursting of water-pipes during frost; but the injury to Wet Gas-Meters, although quite as real, being internal, is not so apparent. The internal parts of Meters which have been frozen are warped or ruptured, and they frequently receive further injury by the hasty and unskilful method of thawing them, which often melts the solder as well as the ice, unfastening the bearings or other parts of the Meter, thus admitting of large quantities of gas passing unregistered. No Meter, which has been once frozen, should be allowed to remain in use until it has been opened and thoroughly repaired.

It would be less loss to the Companies to allow the Consumers to burn gas for a time without Meters, until they can be replaced by **properly made Dry Meters** which register correctly, and with the action of which the most intense frost does not interfere. This is the only efficient method to prevent the injurious effects of frost upon Gas-Meters.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

AND

COOMBS WOOD TUBE-WORKS, HALESOWEN,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS,

AND

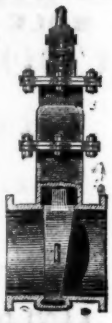
LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,

UP TO FOUR FEET IN DIAMETER.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

Warehouses: London, Liverpool, Manchester, and Lille.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

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ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

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TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.

GAS-FITTERS TOOLS, VALVES. COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

RICH. H. TAUNTON & HAYWARD,

MANUFACTURERS OF

WROUGHT-IRON GAS, WATER, & STEAM TUBES & FITTINGS,

STAR TUBE WORKS, HENEAGE STREET, BIRMINGHAM.

SULPHATE AMMONIA.

R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

Applications for Prices, &c., to be made to

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

THE AMERICAN GAS-LIGHT JOURNAL.

A. M. CALLENDER & CO., Proprietors. **G. WARREN DRESSER, Editor.**

Issued Semi-Monthly at No. 42 Pine Street, New York City.

The Journal is especially devoted to Gas Engineering and Manufacture, and is the official organ of the AMERICAN GAS-LIGHT ASSOCIATION, and the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Subscriptions at $3.50 per annum, post paid, to Great Britain, may be made direct by forwarding Post Office Money Order or Draft to the above address. Rates of advertisement, $2.00 an inch. Special rates for larger spaces.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE

SILBER LIGHT COMPANY, LIMITED,

49, WHITECROSS STREET, LONDON, E.C.,

Manufacturers of SILBER BURNERS FOR COAL OR AIR GAS, & FITTINGS.

No. 285.

The Silber Tubulated Gas-Burner.

The *World* says: "The light given by these Burners, besides being abundant in quantity, is almost like sunlight in its quality, so that it produces the same spectrum when refracted through a prism, and allows even the most delicate shades of colour to be distinguished."

Dr. W. WALLACE, F.R.S.E., F.C.S., says: "It gives the steadiest flame of any Argand yet constructed."—*Vide* Report presented to the Dublin Meeting of the British Association, Aug. 15, 1878, "On the Best Means for the Development of Light from Coal Gas of Different Qualities."

No. 291.

The Silber Tubulated Gas-Burner, with Opal Shade and Cup and Governor attached.

The *London Medical Record* says: "This uniform blending of the air with each part of the flame results in rendering it pure and white, and very considerably lessens the blue colour, which is significant of waste, and which is very plainly visible at the base of all imperfect lights. The creation and the maintenance of this white light—not yellow light—is a proof of perfect combustion.

No. 286.

The Silber Bat's-wing Gas-Burner

The *Sanitary Record* says "Mr. Silber's improvements render it possible to eliminate, as far as is practicable, the sulphuric acid due to the incomplete combustion of impure gas."

The *British Medical Journal* says: "In the whole of Mr. Silber's inventions there is noticeable a complete attention to, and adoption of, natural laws."

THE SILBER LIGHT COMPANY, LIMITED,

Are also Manufacturers of every description of Lamps for Railways, Ships, Streets, Churches, and Domestic Purposes.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER,

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,

ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

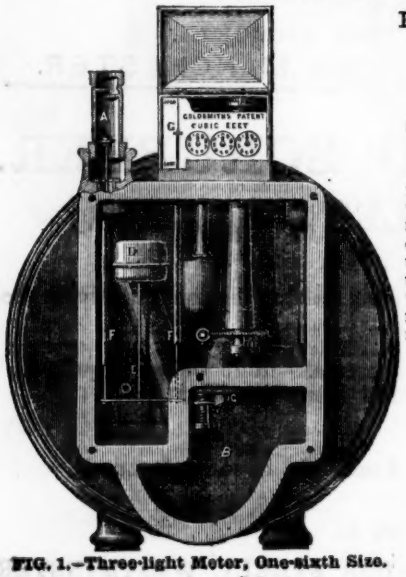


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

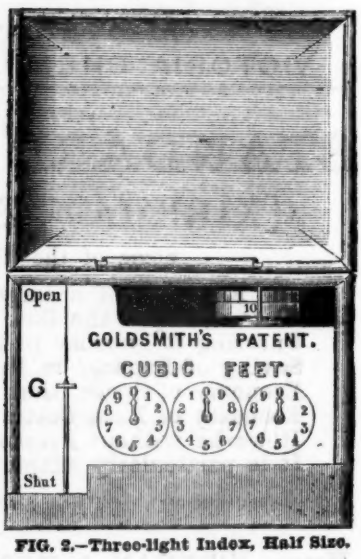


FIG. 2.—Three-light Index, Half Size.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

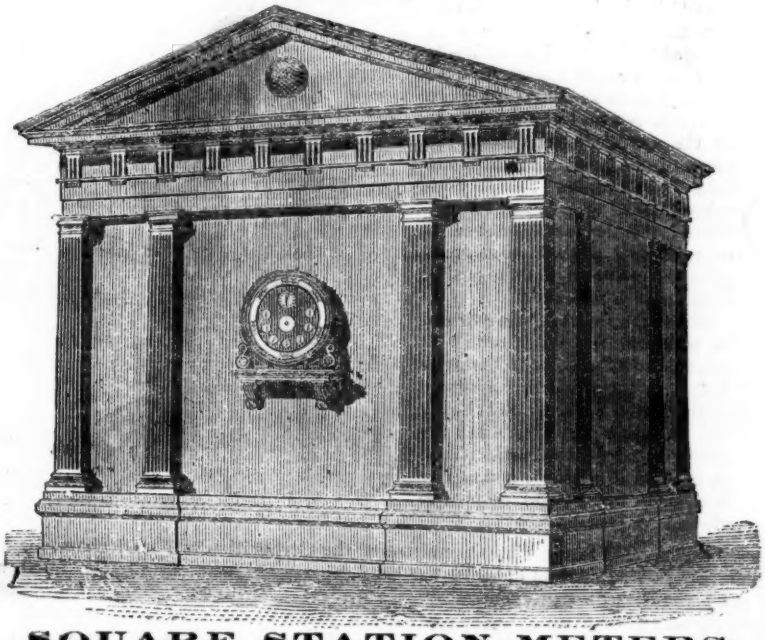
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1800.

BENJAMIN CARPENTER,

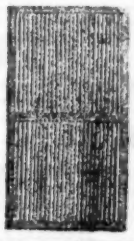
THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES FOR GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD

LONDON, N.



DEMPSTER & SONS'

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 PERT WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, NEAR HALIFAX.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING

MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS

RATCHET BRACES, LIFTING-JACKS,

ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:

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R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. MEDAL, LONDON, 1862. GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners.

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

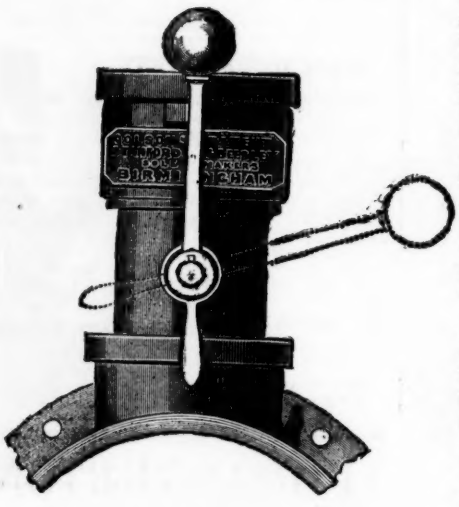
Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:
R. W. W. & CO.

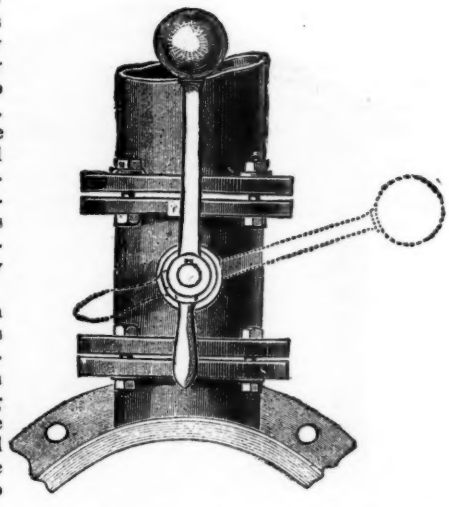
LONDON OFFICES & SHOW-ROOMS: 141, FLEET STREET, E.C.

COLSON'S PATENT ASCENSION-PIPE THROTTLE-VALVE.



THIS Valve is designed to supersede the hydraulic seal, and is intended to be placed immediately in or on the retort mouthpiece, or at such a distance therefrom as to be within reach of the workman. By the use of these Valves, the whole of the pressure is removed from the retorts, and a largely increased make of gas per ton obtained; the deposit of carbon is very slight, choked ascension-pipes are unknown, and the quality of the coke is improved.

When the retort is being drawn or charged, the lever, which is attached to a Spindle and Throttle-Valve, is thrown over as shown by the dotted lines, thereby closing the ascension-pipe; but when the retort is sealed, the lever is placed in a vertical position, and a free way made for the gas to pass to the relieving main.



The Valves (upwards of two hundred in number) supplied to the Gas Committee of the Corporation of Birmingham, for their Windsor Street Works, continue to give complete satisfaction, and no difficulty has been experienced in working retorts fitted with them in combination with others worked in the usual way with the hydraulic seal.

The following important testimonial has been received:—

Corporation of Birmingham Gas Department, Windsor Street Works, Feb. 17, 1878.

MESSRS. STANFORD AND BEESLEY.

DEAR SIRS,—In reply to your inquiry, I beg to say that the Valves (Colson's Patent) supplied by you in July last have given entire satisfaction. The retorts fitted with them are worked side by side with others having the ordinary dip-pipe, without any difficulty being experienced.

Yours truly, (Signed) CHARLES HUNT.

For further Particulars, apply to

Messrs. STANFORD and BEESLEY,

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In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

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TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

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Yours truly,

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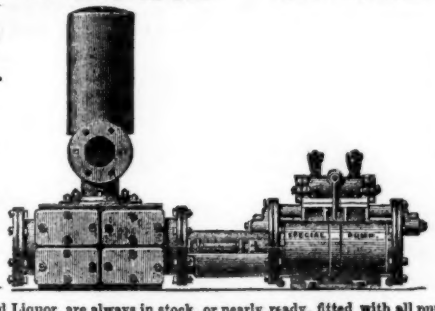
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



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Are upheld for five years without charge.

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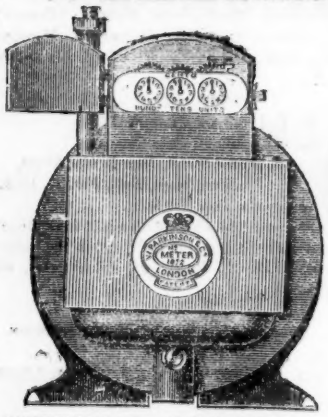

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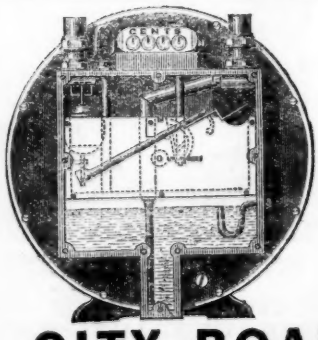

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COTTAGE LANE, CITY ROAD, LONDON, E.C.

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The Journal of Gas Lighting is supplied direct from the Office to any part of the United Kingdom, at the rate of 21s. per annum, payable in advance. If credit be taken, the charge is 25s.

Subscribers who desire to avail themselves of the reduction in the subscription to the Journal by paying in advance for the year 1879, are reminded that this can only be done during January.

Post Orders to be made payable at the Chief District Office, St. Martin's-le-Grand, London, to Walter King, 11, Bolt Court, Fleet Street, E.C.

Vol. XXXII. (second half of 1878) will shortly be ready, bound in cloth, gilt letters, price 18s. Cloth cases for binding (2s. 6d. each) may be obtained on order from any bookseller, or from the Publisher.

TO CORRESPONDENTS.

Ignoramus.—*No, there is no way, except a change of coal.*

C_2H_4.—*We do not know any place where it could be obtained; but will make inquiries.*

R. K.—*The cost would entirely depend on the kind of opposition you intended. We could not give you any idea of the amount without further information.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 21, 1879.

Circular to Gas Companies.

Ecce iterum Crispinus! The electric light once more. The last exhibition of this illuminant we have seen is at the Liverpool Street Station of the Great Eastern Railway. It is the Wallace-Farmer system, which, it seems, closely resembles the Rapieff. The lights are open, like Mr. Werdermann's, and are undoubtedly of great power. Still, we may candidly express an opinion that the exhibition is a ghastly one. A good account of the display on another evening is furnished by our correspondent, Mr. F. W. Hartley, C.E., who appears to have witnessed it under somewhat different conditions. The platforms, however, are undoubtedly fairly well illuminated, but the lights, when we saw them, were extremely unsteady, and a ticket collector expressed a strong wish for the re-introduction of gas. That reminds us to report the conversation of some silly people who were loudly vaunting the superiority of the electric light over the gas-lamps burning. The fact was, that the gas-lamps were turned down as low as possible, not one of them, so far as we could observe, burning more than a foot an hour. No wonder, therefore, that a light giving reputedly an illumination of about 250 candles, eclipsed one produced by the combustion of only a foot of gas per hour! The passengers, however, got into the carriages, and went home contentedly reading their evening papers by the aid of gas-lamps consuming only about three feet per hour.

We may here express a strong opinion that a great deal too much fuss has been made about the electric light. No amount of puffing could promote its adoption, and no amount of hostile criticism could stand in the way of its use, if it were proved to be economical, and adaptable to all the requirements of public and private illumination. The best friends of Gas Companies, like Messrs. Kirkham and Hersey, cannot suppress this new illuminant, glad as they and we might be to do so. We must accept established facts, and it is rather lamentable, at the present moment, that we are so little informed as to the actual power and cost of the electric light.

In another column is published a communication from our respected correspondent, Mr. W. Mann, who gives a valuable summary of the experiments made with the Siemens and Gramme machines at the South Foreland, in 1877. Both the machines have been considerably altered and improved, but the value of the alterations remains to be demonstrated. At the present moment, there is little to be said in deciding in favour of a safe and a continuous action from any single machine. It is well known that they all break down, sometimes with surprising rapidity, and nobody knows for how many consecutive seconds their steady action may be maintained. This is one reason why we object to the "fuss," as we have said, which is being made about the electric light.

Recurring to Mr. Mann's paper, we may notice that the Commissioners of Sewers have directed Lieut.-Col. Haywood and Dr. Saunders to report upon the relative cost of the electric and gas lighting upon the Holborn Viaduct, and the amount and power of light afforded by each process. To our mind, the experiment has lasted too short a time for any satisfactory conclusion to be arrived at as to the cost. What means the Commissioners of Sewers have of comparing the illumination afforded by the electric, with that furnished by the ordinary gas-lamps, we have only a faint idea. It seems premature, with so short an experiment, to attempt to decide the cost, and to estimate the risks. The relative illuminating power could, of course, be arrived at, with proper appliances, in a very short time.

A very able report by Messrs. W. H. Bennett and W. A. Valon, on the experiment recently made with the electric light at Westgate-on-Sea, will be found in another column. The experiments were made under circumstances peculiarly favourable for the light. The price of gas is high at Westgate; still, it held its own against its new rival, it being estimated, according to the report, that, at an expense of £16 15s. 4d., an equal amount of light could have been obtained from coal gas, to that furnished by electricity, which costs £40 9s. 4d. The report of Messrs. Bennett and Valon shows what the cost of the electric light will be in out-of-the-way country districts. Westgate will, no doubt, some day be a fashionable watering-place, and increased means of illumination will be urgently required. Time alone can show whether this will be furnished by electricity or by gas. Let us repeat once more, that the success of the former cannot be accelerated or retarded by any amount of newspaper writing.

It will be seen, by a report published in another page, that the Municipal Council of Paris are recommended, by their Gas Committee, to make some further trials with the electric light, in conjunction with improved gas lighting. We can well understand how these will end. Gas will come out triumphant, even at the rate which is charged for it in Paris. The experiments are to be made at various important points, such as the Place de la Bastille, the Halles Centrales, the Place du Château d'Eau, &c. It will be seen that the experiments proposed by the Gas Committee of the Municipal Council are to be of an exhaustive character. It is well, we may be excused for saying, that these experiments should be made. We wish to learn as much about the electric light as possible. It must be a success or a failure. We take it that, up to a certain point, it will prove a success; but beyond that, so far as can be seen at present, it is not likely to advance.

The Liverpool Town Council have decided on promoting a Bill (as has before been reported) to enable them to furnish the

electric light *within the limits of the borough only*. They seem to be doubtful whether the out-townships would submit to be subject to further control under the Corporation, and so the Council very properly leave them to take care of themselves. The same measure proposes to empower the Corporation to agree with the Liverpool United Gaslight Company for the transfer of their undertaking. It is to be observed that the Council ask for no compulsory powers. They desire to possess the undertaking, but they entertain a wholesome horror of parliamentary litigation, and a subsequent arbitration. It will be seen that, in this case, there is no necessity for any proceedings under the Borough Funds Act, 1872. The Liverpool Corporation, like the Corporation of the City of London, have large private means, which they can employ in the promotion of Bills. Whether or not the Liverpool United Gas Company will come to terms, remains to be seen. It is to be sincerely hoped the Company will stand out, and maintain their independent position. Their business is not more remunerative than a manufacture involving many risks and responsibilities should be. The Company may part with their concern if they are so disposed; but, deprecating, as we do, the transference of a commercial undertaking to a corporate body, we hope that they will adhere to their property, and continue to do as they have always done—furnish Liverpool and its neighbourhood with gas of excellent quality at a fair price.

The Hove Commissioners are very much dissatisfied with what they call the bad quality of the gas supplied by the Brighton and Hove Company. It seems, however, to have turned out that at the time the complaints were made, deposits of naphthaline had taken place, which, while, of course, reducing the illuminating power, also lessened the pressure of the gas. For this, most of the Commissioners were not disposed to make any allowance; but, at their last meeting, owing to the remonstrances of some sensible members who understood the matter, the subject was allowed to drop. It is not creditable to the Commissioners that an undertaking so well managed as that of the Hove Company, should be made the subject of such frequent attacks. If there be any real grounds of complaint, it will only be necessary to write to the Engineer (Mr. Paddon) to have them all cleared up.

The Oswaldtwistle Local Board have been in a difficulty with apparently only one large consumer, and for his profit, they have resolved to reduce the price of gas—always supposing he takes over 500,000 cubic feet per quarter, and pays promptly—to 3s. 6d. per thousand. To this arrangement, of course, we can make no objection; but there is this to be said, that when large consumptions are arranged for, the measure should always be taken at the entrance to the premises. We know very well that precautions are not taken to estimate closely the consumption of gas within restricted hours, but it is imperative that this should be carefully done. Instances are weekly brought to our notice, but to which we cannot allude, showing the advisability of arrangements with Gas Companies.

The Preston Gas Company have done extremely well during the past half year, paying full statutory dividends, and carrying forward a considerable balance. It will not be surprising if a Company so prosperous excite the cupidity of the Corporation, and probably efforts will before long be made to confiscate the undertaking.

The position of the Exeter Gas Company is a very peculiar one, and we publish to-day, with some reluctance, a letter on this subject, signed by our well-instructed correspondent, "Isca." We may assume that all negotiations between the Town Council and the Company are at an end. The town's meeting settled that point, and the position of the Company now has alone to be considered. What is that position? The affairs of the Gas Company have been before the gas world for a year or two, and we have not published a tithe of the correspondence which has reached us, dealing with the condition of the works. Enough, however, has been printed to show that their state is not such as would justify the payment of the usual rate of purchase. We write with all reserve, but it may be fairly asserted that in Exeter there is a grand field for a Gas Company who can fairly fulfil their duties and responsibilities. The present Company are, no doubt, able to do so, if they can only find means to tide them over their difficulties. Money will, doubtless, be forthcoming from many quarters, and if the Company take the advice of the able engineers who are competent to advise them, they may, in time, reinstate their works and plant in a condition to satisfy the most urgent needs of the city. In the meantime, they may, perhaps, find it to their interest to change their front, as soldiers say, and modify the conditions of sale. We are far from saying that either the Ratepayers or the Gas Company are wrong in the positions they have respectively taken up. The former are probably thoroughly justified in resisting the terms of purchase, and the Company are equally justified in standing out for the terms to which the Town Council assented.

The Corporation of Batley have decided to reduced the price of gas 3d. per 1000 feet, with a discount of 6d. per 1000 feet to consumers within the borough for prompt payment. The gas undertaking has proved very profitable to the Corporation, they have accumulated a large reserve, and we think the price might have been reduced still further. But the public lighting is paid for out of profits, and so the ratepayers of Batley will be contented with the reduction.

Water and Sanitary Notes.

THE Cheltenham Water-Works have been transferred from the Company to the Town Council. The bargain, as matters of the kind go, is financially a just one; but how will the water consumers of the borough be benefited? Will they get cheaper, or will they get better water? And who knows what better water means? Will it be water from higher up the Severn, or from the hills and valleys round the district, if the Town Council are inclined to go to the expense of providing an entirely new source? The terms of purchase are exceedingly fair, both Corporation and Company being equally satisfied. The one will accept with perfect equanimity the price paid for the shares, the other, taking over a most valuable property, will wait long, and not without anxiety, for profits which must accrue hereafter.

The Thames Valley Main Drainage Board have been exercised upon the question of separating rainfall from the sewage. They are perfectly right. The maxim of our old friend, Mr. F. O. Ward, with whom we seldom agreed—"The rainfall to the "rivers, the sewage to the land"—eminently applies to the Lower Thames Valley drainage scheme. A double system of sewerage cannot there be considered out of place; indeed, it would, we think, be cheaper than carrying the whole mass to the land, and making, perhaps, a quadruple rainfall exert its influence on a limited area. That rain falls all over the country, is not to be disputed. The deluge may be collected in one district, and utilized on a limited area; but this is not in accordance with nature. Rainfalls should be at once sent into a stream; sewage, if no other available source be at hand, should be put upon the land. The Thames Valley drainage scheme is a very simple question. Of two resources, one is open to the promoters of the system now offered to the ratepayers of the conjoined districts. They may carry the whole contents of their sewers to the land at East Molesey, there to do what good it can in growing monster cabbages, mangolds, and swedes; or, better, separate the rainfall from the sewage, and devote each to the purposes named above.

That wonderful body, the Town Council of Colchester, have been exercised on the question of their sewage, which they allow to escape somewhere. The physico-geographical conditions of Colchester are extremely simple. We do not profess to be completely informed as to the plans which have been laid before the Town Council for the drainage of the borough. The proceedings which have recently taken place at the Colchester County Court, in the case of "*Chopping v. the Mayor and Commonalty of "Colchester*," will go far to settle the responsibility which the Council incur by the present mode of disposing of their sewage. The disposition of the sewage of the borough is a very important question, and must, in the course of a short time, occupy much attention. The case under notice was settled "out of "court," and an agreement was come to, allowing the Mayor and Commonalty two years to remove the nuisance. When will that extraordinary body, the Town Council of Colchester, be awakened to the sense of their responsibilities, and drain the borough—one of the easiest to be drained in the kingdom—in an effectual manner?

Canterbury is a very difficult place to drain effectually. The country around is flat, and it is hard to say at what point the drainage is to escape. Subsoil water "hangs" in the sewers, and means of extrication are not apparent. The system of treatment to be adopted seems, as yet, to be undetermined upon. We may take it that both irrigation and precipitation—of course, with pumping—will be tried. Under the circumstances, it is impossible to predicate which is the more likely to prove successful. The Local Authority of Canterbury will carefully consider how best the sewage can be purified, and we have sufficient confidence in their judgment to believe that they will adopt the most efficient system.

DEATH OF MR. T. H. BOUTTELL, OF SLEAFORD.—The death is announced, on the 5th inst., of Mr. T. H. Bouttell, aged 61, who for the last 14 years was Manager and Secretary of the Sleaford Gas Company. We hear that Mr. Harry Wimhurst, of Andover, has been appointed in Mr. Bouttell's place, and will take charge of the works at the beginning of next month.

THE LONDON GAS COMPANIES.

The article on "London Gas" in the current number of the *British Quarterly Review*, betrays a practised hand. Men who know what the writer of that article evidently knows, and who are also able to write as he writes, are but few. Still fewer are they who, with his knowledge of the subject, are antagonistic to the Gas Companies. His acquaintance with the facts, however, modifies his antagonism. For a thorough-going onslaught on the Companies, we must look to those writers who are not trammelled by any precise knowledge of what they are writing about. The critic to whom we now refer is so far master of his subject that he has no need to go into the region of romance in search of ideas. He simply looks at the facts from his own standpoint, and tells us how they appear to his own mental apprehension. The history which he gives, extending over a period of about twenty years, is a matter concerning which we need not care to hold much dispute. The gas question has now passed into an entirely new phase, and one which naturally concentrates our attention on the future. There are thousands of people who would be extremely glad if they could be satisfied as to the actual prospects of the gas interest. It is tolerably certain that things are not going to remain as they are. But we venture to say that the impending change is one which may not only leave the Gas Companies uninjured, but may even place them in a better position than that which they have previously occupied. The public are crying out for "Light; more "light." The London Gas Companies are now answering this question after the same manner as the verger at one of our great national places of worship, who, hearing these words fall from the lips of the preacher, forthwith raised the gas. So, in London, we see the Companies turning on more gas in order to show the public that there is no need to remain in darkness. If the public want more light, they can have it; but let the light come from what quarter it may, so long as the source is artificial, there is a price to be paid. In a little while we shall know what sort of a bill is being run up for the Jablochkoff light. If the bill proves to be a very long one, the public may be ready to sigh at the vanishing of a pleasant dream concerning the likelihood of lighting towns by electricity. But the electric blaze will have made people eminently dissatisfied with defective lighting. They will then, we trust, give a patient hearing to the Gas Companies, when the latter tell them how gas may be burned to the best advantage, and how the streets may be irradiated with gas so as to exhibit a luxurious light, at a cost very far below that of a Jablochkoff "candle," or any of the other means of electric illumination.

We are quite ready to admit that a new era of artificial illumination is at hand. But let no one suppose that gas is to be superseded. It is said that the Gas Companies are "waking up." No doubt they are; and we hope the consumers are "waking up" too. We wish it were possible to put all gas-fitters through a course of training for their functions, so that gas might never be laid on to a house by an incompetent tradesman. Failing this, we wish that Gas Companies could exercise some little supervision over fittings as well as meters, so that the consumer might not only have his proper quantity of gas, but also a due proportion of light. There is a prevalent notion that gas may be burned anyhow, like coals and candles. If the gas fails to burn well, the fault is laid on the gas, and the Company are anathematized. As well might a householder quarrel with his coal merchant because his chimney smokes. Already we see some advance out of this unsatisfactory kind of relationship, and the more rapidly it is accomplished the better. Mr. Sugg has rendered valuable service by the production of his exquisite burners, which almost deserve to be called scientific instruments, while at the same time suited to ordinary use. Other inventors are also rendering good service in this field, and we only hope that gas supply will be rescued from the miserable maltreatment to which it has so long been subjected. The management of the London gas supply is pre-eminently important at the present time, for on that will depend, to a large extent, the tone of the public Press and the temper of Parliament. The fact that the Chartered and the Phœnix Companies are coming forward, at their own cost, to show experimentally how gas can be made to compete with the electric light, is calculated to produce a very salutary impression. Let it be clearly proved that London can be flooded with light at a cheaper rate by gas than by electricity, and the battle is won. Or let it be shown that, on the whole, there is no practical difference in the cost of the two systems, and we very much doubt whether the public will care to be troubled with the complexities and risks of lighting by electricity. A rage for light has risen up. So much the better for those who sell light. If the Gas Companies take care that the public shall have, not merely gas, but light, and will show that the streets of London have no need of electricity in order to be well lighted, the issue of the controversy will be such that no gas shareholder need regret the advent of Mr. Edison or M. Jablochkoff.

To set up a bright light is not everything Gas Companies have to do. There is such a thing as management. Perhaps we ought to use a term of higher significance, and speak of administration. We have thus far spoken hopefully, but we have done so on the assumption that the Gas Companies will know their real interests, and understand how to promote them. We cannot deny that the present may prove to be a sort of crisis in the history of the gas supply. We feel this the more deeply when we consider the state of affairs in the Metropolis. The gas supply of London ought now to be conducted on the broadest and most advanced principles. These are not quiet times, when men, or companies of men, may sit down and go to sleep, secure that no antagonist or competitor may take them by surprise. Boards of Directors must now use all their acumen to see how they may most effectually and properly promote the interests confided to their keeping. They have already some lost ground to fetch up The writer in the *British Quarterly* gives figures to show that. "taken as a whole, the gas property in London has lost one-"third of its market value during the last twenty months." This is an extreme reckoning, and goes rather beyond the mark. But that there has been a depreciation, although the shares are still at a high premium, cannot be denied. As a matter of fact, the current market value of London gas shares is not much below what it was in the years 1870-74. Still, there is a decline, and the fall since 1876 has been considerable. There ought to be no farther fall, and we believe that, if a proper course be pursued, there will be a recovery. Where the sliding scale operates, there is a splendid opportunity. A policy at once bold and discreet may so raise the dividends as to send up the value of shares, and, as this must needs be accompanied by a reduction in price, the consumers may be expected to remain contented. To lower the price of gas, true economy must be exercised—that is to say, an economy of resources as well as of expenditure. The coke market is now in a most unsatisfactory state. It is often damaged by the conflicting action of the several Companies. There are now mountains of coke at the gas works, waiting for customers. Cannot the use of coke be popularized as well as that of gas? Cannot the coke now in store be sold at a price which, although a low one, will make it better to sell this commodity than to keep it? Enormous quantities of coke are cumbering the ground in the depth of winter, when the fuel really ought to be warming peoples houses, and the money going to make dividends, and lower the price of gas.

It is to the interest of the public to have cheap gas. Still more is it to the interest of the Companies that gas shall be cheap. The lower the price of gas, the less the prospect that electricity will be a fatal foe. The surest way of linking together cheap gas and good dividends is by coming under the action of the sliding scale. Hence, those of the London Companies who are outside the legislation which began in 1868, would do well to come within it. We had reason to hope, some time ago, that the Southern Companies were about to unite with the Chartered. Can any valid reason be given why they have not done so? The existing disunion is hurtful to all. The bundle of sticks is separated, and weakness is the result. The writer in the *British Quarterly* objects to amalgamation. He is an opponent to the Gas Companies, and his objections are accordingly conceived in a spirit hostile to their interests. Not only is amalgamation, in our opinion, to be defended as beneficial to the Companies, but also as desirable on public grounds. It cannot be that the interests of the public and of the Gas Companies are opposed to each other at all points. We might as well say that capital and labour are essentially antagonistic. Amalgamation conduces to economy, and no one can say that extravagance in the management of the gas supply is likely to benefit the consumer. There was a time when amalgamation was almost forced on the Gas Companies. It was in accordance with the views of a Parliamentary Committee that the Chartered Company amalgamated with the Great Central and the City of London. The writer in the *British Quarterly* acknowledges that the Board of Trade "have favoured, and freely given facilities "for this work of amalgamation." He states that the avowed object of the Government Department in favouring the process "is to facilitate the ultimate transfer of the gas supply to the "Municipality;" but he observes that "the Companies regard "each successive act of amalgamation as raising a fresh barrier "against any such transfer of their business." In the opinion of the Reviewer, "the Companies take the more correct view of

"the case." He gives the Directors credit for being "shrewd "men of business," and quotes from what he is pleased to call "their able organ, the JOURNAL OF GAS LIGHTING," in order to show the reasons which lead the Directors to believe that amalgamation will be a defence to the Companies when a complete form of Municipal Government in the Metropolis stands ready to absorb them. We are quoted as saying, in respect to the London Gas Companies, "They can only effectually meet a complete "Municipality by complete amalgamation." The writer in the *British Quarterly* agrees with us that Parliament would hesitate to transfer the whole gas supply of London to untried hands. Hence he would fain stop the further progress of amalgamation, thereby leaving the way open for the Local Authorities to undertake a partial supply, so as to compete, on the strength of the rates, with a dividend-paying Company.

The writer to whom we are thus referring tries, in various ingenious ways, to prejudice the Companies themselves against the policy of amalgamation. He endeavours to show that the Shareholders gain nothing by the process, unless it be the Shareholders of the Chartered Company. As the latter are now two-thirds of the whole, it would seem that further amalgamation must, at all events, bestow the greatest good on the greatest number. In view of a danger which lies ahead, it is admitted that amalgamation would be a sure defence. The Reviewer knows this well enough, and is sufficiently adverse to the Gas Companies to strain all manner of arguments—some of a very conflicting sort—into his service, in order to excite jealousy and division. We trust the London Gas Companies will learn wisdom from this hostile critic. Let them unite, and that speedily. If the Directors are, for some occult reason, disposed to hang back, let the Shareholders see to the matter, and urge the adoption of that policy which affords the greatest protection. It may be said that the electric light is rendering Local Authorities unwilling to acquire gas undertakings. But Gas Companies may obtain power to supply electric light as well as gas, and it is by no means certain that the changed condition of things will render amalgamation any less desirable than it was before. The *British Quarterly* has great faith in the electric light, and—oddly enough—asserts it to be "a most fortunate "matter that the Municipal bodies [in London] did not purchase "the property of the Gas Companies, not only because it would "have proved a bad bargain, but because the Municipality would "naturally have disfavoured all attempts to introduce the new "light in competition with their gas property." It would thus appear that even Municipal Authorities are not to be trusted. It can hardly be said that the London Gas Companies have acted in the narrow spirit thus predicated of the Local Authorities. The Chartered Company have carried out an extensive series of experiments with the electric light, and much interest attaches to the result. "As it is," says the Reviewer, "the field "is clear, and the contest between the old light and the new "will soon be decided." The Chartered Company, we would observe, are doing their best to settle the question for themselves as well as for the public. In addition to their trials of the electric light on their own premises in the Horseferry Road, they propose to light up Waterloo Place and Regent Street, as far as the Piccadilly Circus, with magnificent gaslights, in order to show that gas can compete with electricity in brilliancy and cost. "Let the best win," says the *British Quarterly*, in the concluding sentence of its long and really well-written article. In this final sentiment the Gas Companies may safely concur, and with it we may be content to conclude our present remarks.

Communicated Article.

MACHINERY FOR ELECTRIC LIGHTING.

By Mr. W. MANN.

There are now in London two exhibitions, both of which are said to be instituted for the purpose of proving the usefulness of the electric light in the thoroughfares and larger spaces in and about the Metropolis, and at the same time of giving an idea of the cost of installing and maintaining of the necessary apparatus, if the decision of the Authorities be in favour of the new system of street lighting. The question of illuminating power is also to be considered. This will be obtained from Mr. Keates, the Consulting Chemist of the Metropolitan Board of Works, correctly, no doubt; but I must confess that I question whether the experiments will give the important information involved in the first terms of the requirement. In fact, I think it unreasonable to suppose that the endurance of machines, such as the dynamo-electric, in which high speeds are absolutely essential, can be fairly arrived at by only running half the time that would be required of them in actual practice, especially when it is considered that the wear and tear of ordinary machinery would, in their case, have to be supplemented by the injury likely to result from the heating of the coils, if not carefully watched, during a long and maximum speed run. At any rate, in practice, this casualty would have to be anticipated, and duplicate apparatus put down and kept in readiness to meet this and other emergencies.

The machines at the Holborn Viaduct are worked nine hours out of the twenty-four, and those at the Thames Embankment only six; whereas to represent a night's work of actual lighting at this time of the year, they should be running without intermission nearer sixteen hours. The question might fairly be asked, Why is this, seeing that what is wanted is to get at all the facts with relation to the applicability of the Jablochkoff candle lamp as a substitute for the gas lamps now in action for nearly sixteen hours every night? The only answer that could be given is this: The Jablochkoff candle only burns about one hour and a half; consequently, each lamp on the Viaduct would require ten candles set up in it every day, in order to furnish the means for one night's lighting (100 lamps, 1000 candles), instead of six, as now; and, to prevent the candles burning down into the sockets and going out, some one would have to visit each lamp ten times during the night, to turn the candle ends out of the circuit and bring whole candles in, and so on throughout the night, to keep the lights going. The Embankment lamps also would require ten candles each instead of four, and a visit from an attendant ten times during the hours of lighting. Fancy ten candles in each lamp, with the nursing included, and one has a good notion of the amount of labour required to light the streets by electricity during a winter's night. What is now going on is a mere holiday experiment; therefore, in order to show the difference between it and actual work, I refer your readers to the tabulated statement of the Trial of the Gramme and Siemens machines at the South Foreland, to be found in the JOURNAL for Dec. 11, 1877 (Vol. XXX., p. 909). There are the details, or incidents, of 38 runs of these machines, with but few exceptions, from sunset to sunrise, very carefully noted; but as the gist of the whole matter now under consideration is contained in the "Remarks," which, being made from day to day, are necessarily fragmentary, I will, for the convenience of those interested, give a digest of them, taking care to quote verbatim where anything particular is mentioned.

There were two machines by Gramme, which were designated as "right" and "left" hand, and two by Siemens, known as No. 58 and No. 68; and there being two lights, as nearly as circumstances would admit of, one of each maker was operated every night. The trial commenced on Jan. 26, 1877, and continued until the 7th of the following April.

The first four runs were, on an average, for 15 hours 11 minutes out of the 24, and the machines in action were the Gramme "right-hand" and the Siemens No. 58. In the first run, everything was perfectly satisfactory as regards both machines; but in the second, it was found necessary, at 4.12 a.m., to stop the Gramme, "to adjust one of the commutator brushes, to keep it from flashing." The third run, both machines "worked well all night." The remarks respecting the working of the machines during the fourth run are as follows:—"The Gramme machine ran well all night. The current flashed at the commutators, frequently caused by a piece coming off. The commutators required to be turned up on the surface." "The Siemens machine ran well all night; bearings kept cool. Commutators in fair order." It will be seen that this run foreshadowed the necessity for the skilled labour that we shall meet with as we go on, in order, if possible, to prevent this flashing, which must not be considered a small matter, for, to make the least of it, it is a leaky joint, and would necessitate the putting down of a large amount of the current as lost or unaccounted for, if it were possible to measure it at the producing station, and where used for the production of light, as is the case with gas. The temperature of the coils of the Siemens machine is not recorded, either at the commencement of the run or at the close.

This brings us now to the 30th of January, and also to note four runs of 14 hours and 53 minutes average. The same machines were in action, and the following is a record of the results:—The Gramme gave a good light "all night, but not so steady as on previous nights, owing to the commutators being in bad order." The remark respecting the Siemens No. 58 is, "The commutator was getting badly cut. Took off this morning, turned up, and repaired brushes." This fettling had the desired effect, for the machine is reported to have worked well, and "a good light maintained all night." The Gramme is also reported to have given a good and steady light, with less flashing than on previous nights during this run. With regard to this machine, the same may be said respecting the following night, but not so concerning the Siemens, for that had to be stopped at 6.30 a.m., in consequence of the brushes being "burnt out, and the machine coils, of high temperature (88° Fahr.), caused by the current not leaving the machine properly." The temperature of the engine-room was at that time 60° Fahr. At starting, or sunset, it was 58°, as were also the coils, so it is plain that while the engine-room only increased in temperature 2°, the coils increased 30°.

It is evident, from what follows, that both machines were beginning to feel the effect of the seven runs of (say) 15 hours duration each, for the report says respecting the next night, that the "Gramme machine worked well till 3.40 a.m. when it started flashing at the left-hand commutator. The brush was burned up to the holder, caused by a small piece coming out of the commutator." "Siemens No. 58 machine did not work satisfactorily. Could not keep the brushes from burning, which caused it to work at a high temperature. Commutator-plates in bad order, and will not stand turning up." The temperature of the coils when started was 62°, when stopped 92° Fahr. Here is again an increase of 30°.

The ninth run commenced at 4.51 p.m. on the 3rd of February, and ended on the same evening. The particulars of this short attempt are very carefully noted, thus:—"Siemens No. 58 machine had to be stopped at 6 p.m. on the night of the 3rd, on account of commutator and brushes burning, and coils of machine at high temperature."

During this short time—1 hour and 9 minutes—the temperature of the coils had risen from 57° to 95° Fahr. The report then goes on to state that "after smoothing commutator and brushes, again started at 9 p.m., but could only work it for 15 minutes." The Gramme machine was stopped on account of the mishap to the Siemens, and was not started again till the following night at 8 p.m., from which time it worked satisfactorily until 2 p.m., when it had to be stopped for the remainder of the night," on account of the brushes of No. 58 being burnt out."

We are now at the end of ten runs, eight of which were as near as may be from sunset to sunrise, and the machines used were, as before stated, Gramme "right hand" and Siemens No. 58; but, for some reason not given, the Gramme "right hand" disappears for some time, and the Siemens No. 68 takes its place. The eleventh run is therefore made by using the two machines supplied by Siemens. The remarks made respecting this run have reference to flashing in both machines; and, although not so stated, it may be that the flashing of No. 58 was the cause of the remark that "the carbons could not be burned at the proper distance apart, or the light went out;" at any rate, we hear no more of No. 58, nor for some time to come of the Gramme "right hand" machine. Consequently, the twelfth run opens with a Gramme "left hand," and Siemens No. 68, both of which worked well all night. We may pass on to the twentieth run (March 15), by simply remarking that nothing of importance occurred from the 7th to the 15th that requires notice—if "flashing" is to be treated lightly, and the necessity for the employment of skilled labour during pretty nearly the whole time of, or after every run, is to go for nothing—and come at once to the remarks respecting it. "The Gramme 'left hand' machine worked very unsatisfactorily," but the "Siemens No. 68 worked well;" in fact, it is recorded in *italics* that, "*Last night's run is the most successful this machine has made.*" The next night this machine kept a good steady light all through the night, without flashing of any importance, whilst the Gramme "left hand" machine worked very unsatisfactorily—in short, it was getting near the end of its usefulness; for, respecting the two following runs, that commenced on the evening of the 17th of March, we read that "At 1.40 a.m. the light was out 5 minutes, owing to the under brush on the right-hand commutator getting loose. At 2.15 a.m., had to start Gramme 'right hand' machine; the 'left' one flashed so badly at the commutator, it will be difficult to get it to run a whole night." And, again, the following run: "Gramme 'left hand' machine had to be stopped at 8.40 p.m. It flashed at both commutators so badly that there was danger of injuring the coils of the machine. The 'right hand' one did not run satisfactorily, the commutators being so rough. Two of the brushes are getting too short for use." During both these periods, which were about twelve hours duration each, Siemens is reported to have worked very satisfactorily. But it is right to note that on the morning of the 19th of March the brushes and commutator plates of this machine (No. 68) were renewed.

We start now, on the evening of the 19th of March, to make the twenty-fourth run with the Gramme 'right hand' machine, that gave in about the 5th of February; and the Siemens No. 68, that came in about that time to replace his No. 58, which we have heard nothing of since; and these are the remarks relating to this night's work:—"Had to work Gramme 'right hand' machine all night. A light could not be got from the 'left hand' one. Made another trial with it to-day, in the engine-room, but have not been successful. Could not even get a spark. The 'right-hand' one did not work satisfactorily. There is a continual burning of the brushes." The Siemens worked well.

If we take the fourteen runs from the 20th of March to the 2nd of April inclusive, we find the Siemens machine reported as working well, the commutator plates having been turned up once during that time, but the Gramme machine is, during that interval, often reported as flashing, and during one run, "red burning sparks" are said to "appear frequently at the commutator all night." Two attempts were made during this time to get the "left hand" one to work, but without success. Although the time of running was decreasing from 11 hours 52 minutes to 11 hours, during the fourteen runs in which the Gramme machine was engaged this second time, its condition was such as to elicit, on the 2nd of April, the following remarks concerning it:—"Gramme 'right hand' machine worked very unsatisfactorily; it was run with difficulty all night. The left-hand commutator is in so bad a state it will require to be repaired before it can be worked again." Siemens is reported to be giving a "good steady light, with bearings, commutator plates, and brushes in good order." The following night the remarks are, "Holmes No. 4 machine was worked all night. Gramme machines both out of order." Holmes and Siemens close the trial on the morning of April 7, 1877, Siemens No. 68 having had its commutator plates and brushes renewed the morning before, but not because of any breakdown.

In closing, I would ask, What reason is there for believing that the Gramme (or any other) machine has been so improved of late as to render it exempt from the casualties met with in the quoted remarks, if tested by the work that would be required of it for giving light during the hours of such nights as we are having just now, instead of, as in one instance, a summer's night, and in the other only a little more? Why should not the trial now going on in the Metropolis be conducted after the manner of those at the South Foreland?

SALE OF SHARES AT SOUTHAMPTON.—On Friday last there were offered for sale, at Southampton, fifty £25 shares in the Southampton Gaslight and Coke Company. The prices realized were, for one lot, £29 15s. per share; another, £29 10s. per share; a third, £29 5s.; and the remainder, £29 per share.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE WALLACE-FARMER ELECTRIC LIGHT.

SIR,—There has been a good deal of interest excited lately in respect to the Wallace-Farmer system of electric lighting, inasmuch as it has been said that a steady light could be secured, which might be maintained with the same carbons for a period so long as 40 hours; the carbons consisting of two flat plates, from 6 to 9 inches long and 3 inches in breadth, meeting edge to edge, and being separated, by very simple means, to a sufficient distance to ensure the due amount of electrical resistance.

Hearing that this system was in operation at the Liverpool Street Station of the Great Eastern Railway, I last night paid a visit to that station "to see what was to be seen;" and as the results of my observations may be of interest to country friends who cannot get to London to see for themselves, I venture to send them to you for publication, if you think fit.

I found six lights in operation, three on each of two platforms on one side of the station, the general effect being, of course, brilliant, but attended by such fluctuations in intensity as to render the lighting painful to an extreme degree. In order to realize more completely the degree of variation, I improvised a photometer by the aid of my pencil and a sheet of printed paper, and stationed myself near to a gas-light (an ordinary bat's-wing or fishtail), in such position that the necessary two shadows were cast on the paper—one from the gas-flame, and the other from the electric light. Prepared as I was to find fluctuations, my surprise may be conceived when I found that, at varying intervals—sometimes of 5 or 6 seconds, sometimes of 15 to 20 seconds—the gas alone gave me the light to see by—the gas shadow being dense, and the electric shadow invisible. I carried on these observations for fully half an hour, until, in fact, my eyes were so distressed that I could not continue. I had been told that the light was, "at times," perfectly steady and equable in intensity. Possibly it may have been so, although something else I learned led me to doubt the statement. But certain it is that any light whatever which so frequently alternates from what is practically darkness to its highest intensity—even if such alternations only occur occasionally—is not a light which is suitable for a workshop or even for a street, or, indeed, for any purpose whatever.

As it was impossible for me to measure the respective distances from the gas light and from the electric light, I am unable to make any statement in respect to their relative intensities—any such statement would, moreover, be of no value, unless the intensity of the gas-flame had been first ascertained.

Turning afterwards over to the half of the station lighted only with gas, I could not but feel much more satisfied with the general effect than I had been with the intermittent glare of the electrically lighted part of the station.

F. W. HARTLEY.

55, *Millbank Street, London, S.W., Jan.* 14, 1879.

P.S.—Have just met with a newspaper report in which the fluctuations are attributed to "the quality of the carbons, which are simply sawn slabs of gas coke [carbon]." Better carbons are promised, and then the merits or demerits of the system will be proved. In the meantime, one can but wonder that any trials should be made with unsuitable materials.

F. W. H.

Jan. 15, 1879.

THE PROPOSED PURCHASE OF THE EXETER GAS-WORKS.

SIR,—The case of the Exeter Gas Company and the Corporation presents, as you remarked in a recent number of the JOURNAL, many points of interest; and the state of affairs which has been brought about by the refusal of the ratepayers to sanction the purchase of the gas-works by their representatives, is so far unique as to render the future course of events at Exeter something which should be earnestly watched by those who may at any time find themselves similarly situated.

As far as I can understand from the published accounts of the progress of the negotiations, the ratepayers object to sanction the proposed transfer, on the ground that the stipulated price is exorbitant. It is not denied that other towns have purchased works on precisely similar bases, and have not repented of their bargains; but the objectors in this case allege, with considerable force, that the works and mains have been starved for years, and are now in such a state that a sum equal to the present capital of the Company must be immediately expended, in repairs and renewals, before the works can be considered on a satisfactory footing even for their present status and position, and that to make a thoroughly good job it will be necessary to remove the works bodily, and re-erect them elsewhere, at an estimated cost of double the present capital.

Now, what I, and perhaps a number of other disinterested spectators, would like to be authoritatively informed about, by some one whose dictum could be referred to hereafter, is briefly this: Is it right and fair for a gas company, who have starved their works for years, in order that full statutory dividends might be paid on their small and snugly-held capital, and also that the price of gas, by which they have secured this desirable object might not be subject to parliamentary revision on application for further powers, to demand as much, for the profits that they thus realized, as would be paid for the business of a company whose operations had been carried on upon principles of equity, and whose profits had been the result of a fair combination of capital with brains?

It appears to me that we have here the case of a company who have kept their profits to themselves as long as possible, knowing well that, at no very distant date, the new regulations of Parliament would be brought to bear on their proceedings, and therefore determining to make hay while the sun of practically impregnable monopoly still shone. The Company were old, the works were old, the mains were old, why should they not go on as long as possible, patching up their old property and pocketing full dividends? And if the old stuff had to be sold—well, it had made the profits, which would then be capitalized, for the old proprietors, or they would get amply-secured annuities for the full value, and

those who would come after the old directorate might sweep away the old things, and get new in place thereof, if they chose.

It was probably these or some similar considerations that moved the Exeter ratepayers to reject the works at the price proposed. They failed to see why they should pay a full premium to the proprietors of an old concern, which, as far as structure is concerned, was at its last gasp. As you, Sir, remarked, "they do not understand the principle of buying profits," especially when the apparatus by which those profits had been realized would have to be replaced at a cost which would make the profits disappear. And my object, in now addressing, through you, the world of gas engineers, is to elicit some common-sense data for reckoning the value of structures and plant when dealing with valuations of profits for transfer; because it appears at present as if a premium were being offered for niggardly and fossilized forms of management, if the means by which profits are secured are not to be taken into account.

I, for one, think that the Exeter ratepayers are not to be blamed for their action. Even setting aside the question of exorbitant purchase-money, the manner in which the members of the Council, or some of them, attempted to bribe the ratepayers into assenting to the scheme, by dangling before their eyes the prospect of heavy profits to be applied in the reduction of rates, deserves the rebuff it has received. Gas profits should be for gas consumers, and the false doctrine of taking money from consumers to return it—with deductions—in the shape of reduced rates, cannot be too often or too strongly condemned.

I have only to add that I am entirely with you, Sir, in the main question of the undesirability of public corporations assuming the attributes of trading associations. It is wrong in principle, and no amount of separate instances, conducted with apparent success, will ever make it fundamentally right. It will be well if the case of Exeter serves to draw attention to the underlying principle, as well as to some of the subsidiary considerations.

ISCA.

WEIGHTS AND MEASURES ACT, 1878.

SIR,—In the JOURNAL of the 14th inst., there is a letter from a correspondent, in reply to observations of mine on this subject, in the number published on the 7th inst. In this letter your correspondent refers to a former one of his own on the same subject, which appeared on the 10th of December, and says that "no one has replied thereto." This letter escaped my notice at the time of publication, and until referred to on the 14th inst., I had not seen it.

Your correspondent says, that we do not want to be informed that "over" measure or "over" weight will not render our transactions illegal. If he had read my letter attentively, he would have seen that I was merely replying to questions put to me by other persons, and he might, while so confidently expressing his own opinion as to the operation of the Act, have shown some deference to those of others, who, to judge from their position, are quite as capable of forming an opinion as to the working of this Act as he is himself. In truth, the Act so expressly prohibits the use of heaped measure, that any person may well be excused for thinking that it is illegal so used; but the difficulty about the sack, your correspondent must forgive me for saying, is one entirely of his own creating.

Your correspondent further remarks: "A three-bushel sack is not a standard measure under the Act—*ergo*, a chaldron must be measured by the bushel, *or by a measure containing* 36 *bushels*, 'the internal diameter of which must be double the internal depth.' But, *assuming* that a sack of three bushels is considered a measure—it being 'the multiple of a bushel'—then we are to measure a sack of coke in 'a hollow cylinder, having a plane base, the internal diameter of which shall be double the internal depth.'" "It occurs to me that the new Act cannot strictly be carried out by gas companies, and that a 'sack' measure of a different shape to the 'standard bushel measure' is wanted; in fact, the continuance of the present mode of measuring coke by the sack should be permitted."

I dealt with the heaped measure in my former letter, so need not refer to it again. I will, therefore, confine these remarks to this difficulty about the sack.

First, in reference to the letter itself. It is an inexcusable exaggeration to say that a chaldron must either be measured by a bushel, or by a measure containing 36 bushels. A measure may be made of any multiple of the bushel that may be required—3, 6, or 9, or any other. A sack is not a measure, and, for very obvious reasons, never can be made one. It is merely a bag for the convenience of removing the article purchased, and, as generally used, it represents (but not legally so) three bushels, and no alteration of measures can ever make it anything else. The Act does not require that the sack should be measured by the three-bushel measure.

The whole of this argument is grounded on the supposition that every bushel of coke that is sold and delivered must be measured, and consequently that coke cannot be put into a sack, cart, barge, or anything else, without using a standard measure for the purpose; but this is altogether a delusion.

A chaldron of coke is 36 bushels, measured as prescribed by the Act, and not 12 sacks. If a company undertake to deliver a chaldron of coke, they are bound to deliver such a quantity as will, if measured, give 36 bushels in that way; but they are not bound to measure it before they send it out, nor are they bound to deliver it in vessels or sacks of any particular shape or size. On the contrary, they may use vessels or sacks of any form they think fit, either for loading or delivery; or, if the capacity of a cart or a barge is known and recognized by both buyer and seller, they may throw the coke loosely into the cart or barge with the shovel, without any measuring at all; or, for the convenience of loading, put it in bags or sacks of any shape or size at hand, or into iron tubs or baskets, empty clay casks, or anything else; and, if the capacity is not known, they may fill one of the tubs or casks by the standard bushel, and, having ascertained the contents of that one, calculate the total quantity by it.

There is nothing in the Act to prohibit the use of iron sacks (if the term is allowable), of any shape that may be found most convenient for the purposes of loading, as heretofore. If a customer insists upon having his purchase measured, the iron sack may be filled by the standard bushel, in his presence for the first time, and be afterwards used without being measured, and this would be measuring, by the standard measure, within the strict meaning of the Act; it being, of course, understood that the iron sack itself is in no case to be made use of for actual measuring purposes. Iron sacks have been used for loading at all large works, for many years, but they have not, within my knowledge, been stamped; on the contrary, I think it may be assumed that, for the most part, they have not been stamped, as the custom with almost all companies is to make them in excess of the true or standard measure, and an inspector can only stamp a measure that is precisely true, neither more nor less. If, therefore, this was legal then, it is so now; or if it is not legal now, the companies have been pursuing a wrong course for many years past.

I do not know the exact shape of a bushel measure under this Act, but, for the sake of illustration, will suppose it to be 18 inches in diameter and 9 inches in depth—and it must be something very near to this. If, then, it is desirable, for the convenience of loading, to have a variety of vessels containing two, three, or four bushels each, the simplest and most satisfactory way of having them made is to make them all of precisely the same diameter, and to regulate the number of bushels by simply varying the depth—that is to say, taking the standard bushel at 18 in. by 9 in.,

The two bushel would be 18 in. by 18 in.
„ three „ „ 18 „ 27 „
„ four „ „ 18 „ 36 „

And, by way of allowing for free measure, an extra inch or so in depth might be given for each bushel, as the company felt disposed. Vessels made in this way would speak for themselves, and any ordinary labourer or carman could, by the application of a common foot-rule, satisfy himself that they were correct.

Your correspondent concludes by saying: "The Secretary of the Gas and Water Companies Association, having had no experience in gas-works, may not see the difficulty of using such a shaped measure for serving coke customers, and filling their sacks from such a measure." But the Secretary thinks that your correspondent might have given him credit for having wit enough to see, without any very large experience, that to fill a sack with a measure in the shape of a washing-tub would not be a convenient mode of doing so.

W. LIVESEY, Secretary.

Gas and Water Companies Association, 6, Victoria Street, Westminster, S.W., Jan. 18, 1879.

GAS COMPANIES AND THEIR CUSTOMERS.

SIR,—The letter of "Cum Multis Aliis," in your JOURNAL of the 14th inst., contains valuable suggestions upon this subject. There is, however, one point upon which I wish to offer a remark.

The periodical calling upon a consumer by an officer of the company, merely to offer suggestions as to the burning of gas, might be regarded with some disfavour, and, if so, I would suggest that the gas company should, where practicable and convenient, provide a room at their chief offices, for the permanent exhibition of the best forms of gas-burners, gas-stoves, &c.; with an attendant able to explain and demonstrate to consumers how they can obtain a maximum amount of light or of heat, as the case may be, at a minimum of cost. The addition of a jet photometer, illuminating-power meter, &c., would, I think, in the end, satisfy the consumer as to the honesty of the gas company, and of their desire to give him the value he pays for.

C. TAYLOR.

Derby, Jan. 17, 1879.

GAS LIGHTING *VERSUS* ELECTRIC LIGHTING.

SIR,—We are somewhat at a loss to understand how you arrived at the conclusion that we "exaggerate the importance of the electric light," seeing that the sole object of our pamphlet was to show that gas companies had nothing to fear from it. We stated that its illuminating power had been exaggerated, that it was extremely unsteady, unpleasant, and inconvenient, and that its cost alone would be fatal to it in comparison with gas; and we concluded by expressing our opinion that gas shareholders need not be alarmed, either for their dividends or capital.

Kindly put us right with the readers of the JOURNAL.

KIRKHAM AND HERSEY.

21, *Abingdon Street, Westminster, S.W., Jan.* 15, 1879.

THE USE OF GAS-ENGINES IN GAS-WORKS.

SIR,—In reference to Mr. H. Wimhurst's account, in last week's JOURNAL, of the working of his gas-engine, I consider he has afforded valuable information to managers of small gas-works. He has not, however, in my opinion, gone far enough. He should have told us the cost of the entire apparatus fixed ready for use, exclusive of the building, as well as what size house it required.

Seeing that all gas-engines run at one speed—160 revolutions per minute—and that the exhauster varies according to the make of gas, I should like to ask how they are to be adapted to the present machinery. Fison's patent apparatus is, I know, an excellent arrangement; but where the appliances now employed are in fair condition, and have, perhaps, only been in use a few years, it is a serious thing to have to go to Directors to ask permission to remove good plant, much as we may desire to promote day consumption by introducing the gas-engine into our works.

I should like, through the medium of the JOURNAL, to ask, for the benefit of those of my brother managers who may be similarly placed to myself, whether the gas-engine could be used instead of the steam-engine, by simply replacing one by the other, without having to interfere with the other apparatus. I may say that in our case we have a four-speed cone pulley on our exhauster, as well as one on the shafting overhead, and this, I think, will make it easy for us to adopt the gas-engine in these works. Besides this, we have a 3-inch throttle-valve bye-pass, to allow of the gas being pumped over again.

I cannot agree entirely with Mr. Wimhurst in thinking that we should save the labour of one or two men, for, as in most small works, our head stokers look after the engine, &c., and a pretty mess they often make of it. Sometimes they have 40 lbs. pressure of steam, at others only 20 lbs., and I have frequently been called up in the night because no

water could be got into the boiler, the engine very often having to be stopped on that account—perhaps when it was most needed.

We certainly should be spared much of the trouble and annoyance we are now subject to from water-gauges bursting, feed-pumps getting out of order, steam being let down, &c., if we were allowed to employ gas-engines; for, as our Andover friend says, we should only have to see that the engine was well lubricated to keep it going.

Before concluding, I should like to ask whether any one can tell me what size gas-engine would be required to drive a 10-inch exhauster and two 4-inch pumps, raising water about 12 feet, and sending it into tanks 20 feet high.

I think, Sir, if you will allow this question of the use of gas-engines in gas-works to be fairly ventilated in the JOURNAL, it will tend greatly to the enlightenment of us working managers, as well as aid us in pushing the day consumption of gas.

ALFRED THOMAS.

Basingstoke, Jan. 15, 1879.

GAS-TESTING IN ST. PANCRAS.

SIR,—I have read in your JOURNAL of the 14th inst. some remarks upon the question at issue between the St. Pancras Vestry and The Gaslight and Coke Company as to the illuminating power of the gas supplied by the latter, tested by the officer appointed by the Vestry.

In your remarks, you make some reference to me as being one, among others, who tested the gas, and found it more than two candles below the standard.

Permit me to say that, so far as I am concerned, you are entirely misinformed. I tested the gas, and made a report to the Vestry of St. Pancras. Of course, I cannot explain the terms of my report, inasmuch as it is for the Vestry to withhold or to publish it, as they think right; but I am bound to say, in self-defence, that I did not find the gas more than two candles below the standard, and that, so far as I know, there is no mystery attached to the case.

T. W. KEATES.

Jan. 18, 1879.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1879.

Memorials, complaining of non-compliance with the Standing Orders in the cases of the following petitions for Bills, were deposited in the Private Bill Office before the 16th of January:—

Rotherham Borough, from Frederick Parker Rhodes and others.

South Shields Extension and Improvement, from Robert Dalby Dalby and others.

Wisbech Gas, from John William Stanley and others.

Legal Intelligence.

WANDSWORTH POLICE COURT.—THURSDAY, JAN. 16.

(*Before Mr.* BRIDGE.)

REFUSING TO SUPPLY GAS.

The Wandsworth and Putney Gas Company were summoned, at the instance of Mr. Murray Richard Workman, residing at 18 The Cedars, Putney, for neglecting and refusing to supply him with gas, under the 36th section of the Gas-Works Clauses Act, 1871.

Mr. JOHN HAYNES appeared for the Complainant; Mr. JONES for the Company.

A summons was first heard against Mr. Workman for the sum of £5 5s. 9d. for gas supplied. He stated that he did not dispute the amount, but he alleged that the Company had cut off his supply illegally. An order was made for payment, with 2s. costs.

Mr. *Workman* then proceeded to give evidence in his own case. He said he had been supplied with gas about eight years. Three years ago the Company sent men to cut off the gas after he had paid the arrears. Since then he had been annoyed by the Company. On the 12th ult. he posted a cheque for £2 6s. 6d. for arrears. When he returned home he found the gas not alight, and he was informed by the servants that they could not light it. He wrote to the Company, and received a letter from the Secretary, stating that the supply had been discontinued, as the cheque was not received.

Mr. HAYNES argued that a notice to cut off the gas was required before the supply was discontinued, and supported his case by a reference to the decision of Justice Lush and the late Justice Quain, in the appeal heard before them in the case of *The Commercial Gas Company v. Scott.*

Mr. JONES disputed the right to notice, as the Metropolis Gas Act, 1860, did not apply to the Wandsworth Company. They declined to supply gas for two reasons—one was that the arrears had not been paid, and the other that the complainant refused to pay a deposit. Their proceedings might be a little harsh, but were necessary. He also stated that a notice to cut off the gas was sent on the 6th of December.

Mr. *Workman* said he had never received it. He had offered to pay the arrears.

Mr. BRIDGE called the attention of Mr. Haynes to the objection raised by Mr. Jones that the Act of 1860 did not apply to the Wandsworth Gas Company.

Mr. HAYNES contended that all the Acts must be read together.

Mr. BRIDGE said he was against him on that point, and dismissed the summons. He advised the Company to accept £2 as a deposit.

Mr. GRAY, the Secretary of the Company, refused to accept the amount without the sanction of the Directors.

REDUCTION IN THE PRICE OF GAS AT HINCKLEY.—The Directors of the Hinckley Gas Company have given notice that a reduced scale of charge per 1000 feet for gas comes into operation in the current quarter, ending March 25th, as follows:—Under 10,000 feet, per quarter, 4s. 4d.; 10,000 and under 25,000, 4s. 3d.; 25,000 and under 100,000, 4s.; 100,000 and under 250,000, 3s. 9d.; 250,000 and upwards, 3s. 6d.; and that 5d. per 1000 feet will be added to these prices, but will be deducted as discount for prompt payment.

REDUCTION IN THE PRICE OF GAS AT TODMORDEN.—For some time past considerable dissatisfaction has been experienced in certain quarters within the Todmorden Local Board district, especially Cornholme, as to the high price of gas. The result is that last week Messrs. Wilson Brothers, who supply a large number of people with gas in that district, issued a circular stating that, in addition to the regular discount, a reduction of 6d. per 1000 feet will be made on all accounts paid on or before the end of each month.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The following is Dr. Whitmore's report on the illuminating power, pressure, and quality of the gas supplied by The Gaslight and Coke Company to the parish of Marylebone during December:—

DECEMBER.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 25 Obsers.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Gas supplied from the Fulham works . . .	16·64	17·31	16·34	26·93	9·25	15·13	0·30	No trace
Gas supplied from the Beckton and Bow works	16·66	17·14	16·30	30·10	14·33	15·00	0·40	No trace
Cannel gas supplied from the Pimlico works	20·84	21·21	20·20	30·66	10·03	18·93	0·40	No trace

Mean of daily readings of barometer . . . 29·54
" " " thermometer . . . 53·91

* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of the gas supplied from the Fulham works, and from the Beckton and Bow works, exceeded 16¼ candles, the highest exceeded 17 candles, and the lowest was never less than a third of a candle in excess of the legal standard. The mean light of the cannel gas was very nearly 21 candles, and this gas also never fell quite so low as the legal standard. The mean quantity of sulphur contained in 100 cubic feet of the Fulham gas was 15·13 grains; in the Beckton and Bow gas it was 15·00 grains; and in the cannel gas, 18·93 grains. In all three the ammonia was less than half a grain. The pressure of all the gases was satisfactory, and on no occasion was sulphuretted hydrogen detected in either of them by the ordinary tests.

METROPOLIS WATER SUPPLY.

Lieut.-Col. Bolton, in his report for December, says: "The state of the water in the Thames at Hampton, Molesey, and Sudbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated), was indifferent and turbid from the 1st of December to the 7th; it then became clearer, and remained in a good condition until the 26th, after which it again became turbid, and continued in a bad state during the rest of the month. The highest flood state of the river at Molesey during the month was 3 ft. 6 in. above, and the lowest 1 inch below the summer level. The rainfall for the month, as taken at the Chelsea works at Molesey, was 1·11 inches. The water in the River Lea was fairly good during the greater part of December."

The following is Dr. Whitmore's report on the composition of the water supplied to Marylebone during December:—

DECEMBER.	In Grains, per Gallon.			In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Free Ammonia.	Albumenoid Ammonia.	Hardness.	Hardness after boiling Fifteen Minutes.
West Middlesex	22·64	0·95	1·18	0·01	0·09	15·4	3·7
Grand Junction	21·78	1·00	1·21	0·00	0·09	14·9	3·4
River Thames at Hampton.	23·40	1·20	1·28	0·04	0·29	16·0	4·2

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, *minus* such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as drawn from the mains, was clear and well filtered; the water taken from the River Thames at Hampton was slightly turbid. The difference in the amount of albumenoid ammonia in the water taken direct from the Thames and that drawn from the Companies mains was again remarkable.

EUROPEAN GAS COMPANY, LIMITED.

An Extraordinary Half-Yearly General Meeting of this Company was held at the London Offices, Austin Friars, on Wednesday, the 15th inst.—W. WHITE, Esq., in the chair.

The SECRETARY (Mr. Henry Dozell) read the notice convening the meeting, also the following report by the Directors:—

The business of the Company has been conducted satisfactorily throughout the past half year, and, notwithstanding the general depression in trade, which has especially affected cotton manufactures, the aggregate results obtained at the seven stations are more favourable than those of the like period in the previous year.

The two new gasholders at Boulogne—one for the principal station, and the other for the auxiliary works—are in the contractors hands, and the additional retort-house at Havre, and new purifiers and buildings at Nantes, are being proceeded with.

The telescoping of the large gasholder at Rouen was completed in the autumn, and afforded such facilities for an improved supply, as to enable the Directors to defer, for at least a few months, the construction of the proposed supplementary works for the more perfect distribution of gas, particularly in an important outlying district, where the consumption is rapidly increasing.

The proposed new gasholder for Nantes, and an extension of retort power at Boulogne have also been deferred for a short time.

At Havre and Boulogne, which were the first stations established by the Company, the system of mains has been partially revised and extended, for the purpose of affording to all consumers a full supply of gas with a minimum of leakage. The cost of these measures is considerable, but it has not been incurred without a well-grounded expectation of remunerative results.

Contracts at reduced prices have been effected for the coals required during the next 18 months, and although the value of coke has hardly ruled so high as in the corresponding period of the preceding year, the total stocks are now less in quantity, and it may therefore reasonably be hoped that no further depreciation will take place in the course of the present financial year.

The Directors are gratified to be able to report that recent returns show a marked and continuous improvement in the rental. The Managers of the stations are now earnestly engaged in carrying into effect measures prescribed by the Board for further developing the Company's business to the greatest possible extent, by encouraging the use of gas for all the purposes to which it is applicable.

Debentures to the amount of £18,850, of which £17,350 had been bearing interest at 5 per cent., came to maturity on the 1st of January. The sum of £6500 was renewed at 4½ per cent., and the balance paid off.

The usual interim dividend for the half year, at the rate of 8 per cent. per annum, will be paid on the 1st of February, by means of warrants, to be forwarded to the Shareholders on the previous day.

The CHAIRMAN: Gentlemen, as there are several new Shareholders in the room to-day, I think it will be as well for me to inform them that this

is only a half-yearly meeting, at which we do not present any accounts. We only make up our accounts once a year; and at our annual meeting, of course, we return all necessary particulars. The report is short, and for a very good reason—namely, that we have little to report to you beyond the fact that we are incurring outlay where the necessities of our business require it, and are deferring outlay where we can do it without running any risk. Our annual rental, is increasing, and I may say that our efforts give good results, and that the final returns for the present year promise, so far as we can see thus early, to show a greater state of prosperity than has ever yet been enjoyed by this Company. Although trade has been dull all over the world, France seems to have suffered less than any other nation, and the towns largely dependent upon the cotton manufacture, such as Rouen and Bolbec, have not been so seriously affected as similar districts in other countries. The political state of France being now more settled, I think that it is not unreasonable to expect a revival of trade, of which some slight symptoms are already apparent. This would bring us a large additional rental, so that the prospects of the Company are evidently pointing to a considerable increase in the consumption of gas. Having secured, upon most favourable terms, our supply of coals for a considerable time forward, and with reduced stocks of coke on our hands, we are, I think, placed in an excellent position to reap the full benefit of the increased consumption of gas, which we are earnestly striving to promote. I need only add that we endeavour to cultivate the most friendly relations with all our customers, as well as with the Municipalities with whom we have dealings, being convinced that, short of submitting to any injustice, the true interest of the Company lies in continuing on good terms with all persons and public bodies with whom we are called upon to transact business. The main objects of the Board, and the instructions we issue to the Superintendents at our various stations, are, to supply gas of an excellent quality, and in such abundance as to satisfy the requirements of every consumer. By these means we hope to maintain our standing, and secure the goodwill of all those with whom we are brought into contact. I may say that our instructions in this respect are ably carried into effect by our staff. While on this subject, I must dwell for a moment, with feelings of great regret, on the loss we have sustained by the death of an officer who had faithfully served the Company during nearly 44 years. I allude to the late Mr. Williams, the Manager of the Caen station. He was personally known to some of the Shareholders here, and I may truly say that he was highly respected by all who were acquainted with him. It is honourable, I think, both to him and to the Company, that the relations of the two should have been so agreeably maintained for such a number of years. You will have remarked, by the report, how we have dealt with the debentures which fell due about a fortnight ago. We declined to renew any above 4½ per cent., and as the resources of the Company permitted us to pay off a considerable sum, I think you will admit that, being in possession of ample means, this was the very best way of treating the matter. I will now move—"That the report just read be received and adopted." I shall be happy to answer any Shareholder who may express a desire to have any further information.

Mr. SOLOMON seconded the motion.

Mr. STOKES asked how the new station, which they had only had for a year or two, was progressing.

The CHAIRMAN said at the last meeting he informed the Shareholders that it was going on very well, and the business was still considerably increasing. The Directors were quite satisfied with the purchase.

Mr. LOVEJOY said he did not know whether the Company had a reserve-fund, or, if they had, whether it was distinct from the other funds of the Company. In other gas companies with whom he was connected, it had hitherto been the practice to have a reserve-fund. From many events that had occurred lately, he thought it prudent that such funds should be kept intact. It had been said that no great calamity could happen to gas companies; but that was a fallacy. When the great fire took place at the foot of Blackfriars Bridge, the large gasholder there was supposed to be in great jeopardy. If anything happened to either of the Company's stations which caused a great destruction of property, what means would there be of replacing it? It appeared to him that the proper fund applicable to such a purpose was the reserve-fund. It had been said that the reserve-fund should be used in connection with the other means the Company possessed, so as to give the Shareholders a very much larger dividend than they otherwise would get; but, in his judgment, that course was wrong. The reserve-fund ought to be kept perfectly independent of the other dealings of the Company. If it only produced 3 per cent., the Shareholders ought to be content with it, so long as it was always available for any damage that might happen. He respectfully wished to submit that point to the consideration of the Board. Of course, his remarks were founded on the assumption that the reserve-fund was not kept distinct from the other funds of the Company.

The CHAIRMAN said that the Company had two reserve-funds—one which was put aside in order that the dividends might be equalized, and another for the general outlay upon the Company's works; and those put together amounted to a very large sum. He could not, however, agree with Mr. Lovejoy, in thinking that the money ought to be put into the Three per Cent. Consols; because a large sum was required year by year to meet the cost of their stocks of coal, &c., and it was better to use the reserve-fund than to discount bills, or have to take the money out of the Three per Cents. People who had been in business would, he was sure, admit that the proper way was to use the money for their own purposes. He thought the very worst policy the Company could adopt would be to place their money in the Three per Cents., and then, when they wanted a large sum, have to go to their Bankers and borrow, or else issue more debentures. The Directors took care that there should not be a single thing connected with the Company which was not thoroughly represented, in meal or in malt, and, whenever an emergency had arisen, they found themselves in a position to meet it, without calling upon the Shareholders.

Mr. LOVEJOY said he had spoken on the matter to many eminent men of business connected with very large establishments, and there was not one of them who did not consider that the reserve-fund ought to be maintained intact.

The CHAIRMAN said the true policy of all people in business was to make use of all the means in their possession, and get the most money they could out of it, instead of investing it in Consols or anything else. As long as the dividends were kept up, and ample funds were at their disposal to carry on their works, the Shareholders would acknowledge that the Directors were carrying on the business in a proper way.

The resolution was unanimously agreed to.

Mr. LOVEJOY proposed a vote of thanks to the Chairman and Directors. He considered that the affairs of the Company were thoroughly well managed, although he was sorry that he could not concur in the Chairman's view with regard to the reserve-fund.

Mr. TAYLOR seconded the motion. In doing so, he asked whether the Directors would have any objection to stating, in the next balance-sheet, the rental obtained from the lighting of public buildings and streets, and the rental from private lighting.

The CHAIRMAN said the accounts had never been issued in that form, and for a very good reason. The European Gas Company were differently situated from ordinary gas companies in England. They sometimes supplied, under cost price, public lights in French towns. That was, in fact, the rental paid for the concessions. If the Municipalities did not choose to burn their gas, they would not have to pay the rental, and the Company might do quite as well if they did not supply the public buildings and streets.

Mr. TAYLOR said he had asked the question, in reference to the electric light. That that light would ever be available for private houses was exceedingly improbable, and his object was to ascertain in what position the Company would be placed if they lost the public lighting, and were confined to private houses.

Mr. BACKLER said the rental of the public lighting amounted to about one-ninth of the private lighting.

The motion was unanimously agreed to.

The CHAIRMAN, in acknowledging the vote, said the Directors were always pleased to meet the Shareholders when they had a good account to give of the business of the Company. He considered that the Company were never in a more prosperous condition than at present. The Directors saw their way clearly to keep up the dividends, and they were doing their best to increase the value of the property. As for the electric light, he thought that gentlemen who pinned their faith to it would very soon regret doing so, and if they had embarked their money in it, would, before long, find that they had very little left. No doubt the electric light was a very pretty plaything; but it was not, and could not be made a commercial commodity. Whether for large spaces or small spaces, the cost was too great. It had been in the market for 47 years. Professor Faraday, 47 years ago, certified that it was a perfect success, and yet, after so long an interval, it had only attained its present position. It could not compete with gas in consequence of its great cost.

The proceedings then terminated.

PRESTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Monday, the 13th inst.—Lieut.-Col. MOUNSEY in the chair—when the following report and accounts were presented:—

The Directors recommend that the usual dividends of 10 per cent. on the stock A, and 7 per cent. on the stock B, be declared.

It is with regret the Directors have to report the loss the Company have sustained by the death of the late Deputy-Chairman, Lieut.-Col. Birchall, whose long connection with the Company and legal knowledge made him a valuable colleague. The vacancy on the Board caused by his death has been filled up by the appointment of B. Sykes, Esq.

At the termination of the ordinary meeting, an extraordinary meeting of the Proprietors will be held, when there will be submitted for your consideration and approval the Bill now before Parliament, asking for powers to enable the Company to extend their limits of supply, to raise further capital, and for other purposes.

Mr. Summersgill, one of the Auditors of the Company, goes out of office on the 13th inst., but does not offer himself for re-election. The Directors regret that, after faithfully discharging the duties of Auditor for 22 years, Mr. Summersgill now finds it requisite to retire from the office.

Revenue Account, for the Year ending Nov. 30, 1878.

Dr.				Cr.			
Coal and cannel	£10,837	18	6	Gas and meter rents	£47,944	4	10
Manufacturing expenses—				Coke £4,794 2 7			
Wages, lime, and water	8,028	15	8½	Tar 2,759 3 5			
General expenditure—				Salts 3,028 1 4½			
Bricklaying, retorts, mechanics, and repairs of works, pipes, meters, &c.	16,554	7	5½		10,581	12	4½
Salaries and office expenditure	2,556	10	0	Sundries	349	11	1
Rates, taxes, and ground-rents	1,899	16	10				
Interest on loans, &c., and commission	2,115	11	11				
Balance carried to dividend account	16,882	7	10½				
	£58,875	8	3½		£58,875	8	3½

Dividend Account.

Dividend paid Jan. 19, 1878	£8,730	0	0	Balance, Dec. 1, 1877	£31,715	14	10½
Ditto July 20,	9,045	0	0	Nov. 30, 1878, by balance brought from revenue account	16,882	7	10½
Balance available for dividends, Nov. 30	30,823	2	9				
	£48,598	2	9		£48,598	2	9

Capital Account.

Amount expended on the works, mains, meters, &c.	£288,064	1	10½	Stock A, bearing 10 per cent. interest	£20,000	0	3
Stock	9,591	17	2	Stock B, bearing 7 per cent. interest	104,600	0	0
Lancaster Banking Company	7,581	13	1	Sale of stock B	115	8	3
Arrears of call	2,705	5	9	Loans	50,859	8	6
Customers	1,747	8	5½	Creditors	3,292	6	10
				Balance of dividend account	30,823	2	9
	£309,690	6	4		£309,690	6	4

The report was adopted, and the dividends therein recommended were declared.

Mr. Ratcliffe was unanimously appointed Auditor of the Company, in the place of Mr. Summersgill, to whom a vote of thanks for his services was cordially agreed to. A vote of thanks to the Chairman and to the Directors, for their attention to the interests of the Company, was also passed.

The meeting was then made special, and the Bill to be presented to Parliament with the object of increasing the capital of the Company, and securing powers for supplying, if necessary, the electric light, was read by the Company's Solicitor, and unanimously agreed to.

BATLEY CORPORATION GAS SUPPLY.

At the Monthly Meeting of the Batley Town Council, on Thursday, the 9th inst.—the MAYOR (Mr. R. Talbot) presiding—the Gas Committee, as briefly reported in last issue, recommended that the price of gas be reduced to 3s. 9d. per 1000 feet, with 6d. per 1000 feet discount to consumers within the borough, and to 4s. per 1000 feet to consumers outside the borough, with a like discount.

Alderman BROOKE proposed that the minutes of the Gas Committee be confirmed, and said there was only one matter to which he need refer, and that was the proposition to reduce the price of gas. Last year the making of gas had cost 3s. 2½d. per 1000 feet, and their Gas Engineer (Mr. C. Eastwood) was of opinion that this year he could make it for 3s. Upon that estimate the Committee thought it would be wise to reduce the price. As the Council would see, a greater reduction was proposed to be made with regard to those outside the borough, who, as they were aware, had been paying for some time a higher rate of 6d. per 1000 feet. At one time, when the price of coals was very high, the gas was sold to them at a loss, and it was thought they ought to pay some little extra now, in order to recoup the Corporation for the loss they then sustained. Consequently, up to the present time, they had been paying 6d. per 1000 feet more than was paid in the borough. The consumers in the outlying district had no risk

whatever, and were not liable to anything, and it was only fair and right that they should pay a little higher price. He thought the Council would see their way to support the Committee in carrying out the reduction.

Mr. TAYLOR, in seconding the resolution, pointed out that the Committee had a reserve-fund of £12,000, and that they were in a good condition for reducing the price of gas.

Mr. SNOWDEN said he was quite in favour of the resolution for reducing the price of gas, but he was decidedly opposed to disposing of the reserve-fund, or applying it to any other purpose than that for which it was intended. It was essential to their business; in fact, it was their working capital until they obtained their receipts. He was in favour of the resolution, for the reason that they had more plant in Soothill than they could use, and he thought the reduction in price would be sure to encourage consumption.

Alderman PARKER, in supporting the resolution, said he would like the ratepayers of Batley to know that the cost of lighting the public lamps was paid out of the profits, whilst if it had to be paid for out of the rates, they could afford to reduce the price of gas 6d. instead of 3d. per 1000 feet. If the cost of lighting the public lamps had to be paid by the general district rate, that rate, instead of being 2s., would have to be 2s. 6d. in the pound. He hoped they would be able, after a time, to still further reduce the price, although he did not wish the Committee to go too fast.

After some further remarks from various members of the Council, the minutes were adopted.

THE LIVERPOOL LIGHTING BILL.

A Special Meeting of the Liverpool Town Council was held on Wednesday last—the MAYOR (Mr. T. B. Royden) presiding.

Alderman WEIGHTMAN moved, and Alderman HUBBACK seconded, a resolution, in confirmation of the one already passed, authorizing the promotion by the Corporation of a Local Bill in Parliament, entitled, "A Bill to make further provision for the lighting of the Borough of Liverpool, and to extend the powers of the Mayor, Aldermen, and Burgesses of the Borough in relation to the supply of light for public and private purposes, and of enabling the said Mayor, Aldermen, and Burgesses to acquire the undertaking of the Liverpool United Gaslight Company, and for other purposes," and empowering the Parliamentary Committee of the Council to take such proceedings and incur such expenses in relation to the promotion of the Bill as shall be necessary; and determining and directing that the same shall be payable by the Corporation out of any moneys, not derived from rates, from time to time standing to the credit of the surplus of the borough fund.

The resolution was passed unanimously.

Alderman WEIGHTMAN next proposed a recommendation of the Parliamentary Committee to the effect that the powers of the Bill, with respect to the electric light, be limited to the Borough of Liverpool. He said it was quite certain that the townships beyond the borough would object to be subject to the powers of the Corporation, and it was quite reasonable that it should be so.

Alderman HUBBACK seconded the motion.

The TOWN CLERK said the Local Boards were under a misapprehension. The Bill, as it stood, did not include them, except the Corporation purchased the gas-works.

The resolution was agreed to, as were also the following:—"That the provisions of the Bill be limited to conferring the requisite powers upon the Corporation, with respect to streets and their own buildings, and to supply electric light and power by agreement to other bodies and persons, but so as not to restrict any person from supplying his own or adjoining premises without thereby breaking up, crossing, through or over, or otherwise interfering with any part of any public street," and, "That the permissive powers in the Bill, with respect to the purchase of the gas-works, be altered so as to provide for the purchase by mutual agreement only, but omitting the provisions allowing the Corporation to agree to leave the terms of purchase to arbitration under the Lands Clauses Consolidation Acts."

Alderman WEIGHTMAN, in reference to the last resolution, said he thought the Parliamentary Committee were perfectly justified in making that alteration. They had had quite enough experience of arbitration, and it ought only to be by mutual agreement between parties that such an undertaking should be made.

Alderman SAMUELSON asked if it was to be distinctly understood that the Bill was to be simply permissive.

Alderman WEIGHTMAN: It is.

Alderman SAMUELSON said there was a strong feeling abroad that it was undesirable that they should trouble themselves about the gas-works at all.

Alderman WEIGHTMAN: The Bill is entirely permissive. We intend to strike out the clause permitting arbitration, and therefore the purchase of the works can only be by mutual agreement.

The Council then proceeded to other business.

THE PURCHASE OF THE CHELTENHAM WATER-WORKS BY THE CORPORATION.

At the Monthly Meeting of the Cheltenham Town Council, on Monday, the 13th inst.—the MAYOR (Mr. H. Willmott) in the chair—the Water Works Committee reported the settlement of the purchase of the water works on these terms:—The Corporation to pay the purchase-money, £74,616, and interest from June 24 to Dec. 24 last, at 4½ per cent. The £1076, with interest from June 24 to Dec. 24, to be equally divided, and the Company to receive the amount invested in the New Three per Cents. in part payment of the purchase-money; that is, the Corporation to give, and the Company to take, a power of attorney for the sale and transfer of the stock, as purchased by the Corporation, in discharge of the £60,079 16s. 2d. invested. The Town Clerk settled the purchase on the 28th ult. on the above-named terms. The Committee having had laid before them by the Water-Works Manager, a report that he had prepared, showing the actual and estimated receipts from various sources, and the probable expenditure and requirements of the Corporation, the Committee had resolved that, for the present, the full rating authorized by the Act, on all houses and shops, be charged, and that with respect to special contracts, no alterations be made.

Mr. PARSONAGE, in proposing the adoption of the minutes, congratulated the Council and the town that the questions in dispute between the Corporation and the Water Company, and which had been pending so long, had at length been settled, and the water-works property formally vested in the Corporation. The Committee, acting upon the authority given them by the Council, had thought that the best way of coming to an arrangement was by a personal interview, and as a result of that interview, a settlement had been arrived at, on the terms described by the Committee's report. It was agreed that the Corporation should pay interest upon the purchase-money, from the 24th of June up to the date at which the money was ready; and that as to the £1076 in dispute, it should be equally divided between the two parties. As a consequence of this arrangement, the money had now been paid over, and the works were in the hands of the town. As to the rating, of course the Corporation would be obliged to charge in accordance with their Act of Parliament, and one of its provisions was that no charge should be made for water-closets. In drawing up the new rate, the Committee had accordingly instructed the Engineer and Manager (Mr. William M'Landsborough), to make it the same as the last rate, with the exception of the closet charges, all other matters remaining, for the present, as they had been under the Company.

Alderman WILSON seconded the motion.

Mr. WINTERBOTHAM said that he did not intend to move any amendment on the motion before the Council; indeed, it had been placed out of his power to do so, the Council having authorized the Committee to come to an arrangement with the Water Company, and the Committee having done so on the terms stated. But he wished it to be understood by the ratepayers, what they had lost or gained by the settlement arrived at; and that, so far as he was concerned, the settlement was decidedly opposed to his views. The result of it was that the ratepayers were £15 worse off than if they had settled on the 30th of October, paying the Company the full amount claimed by them, and without the Company yielding a single iota of their demands. The full amount of principal and interest up to that date, from the 24th of June, was £75,709, giving up everything then in dispute; while the amount now actually paid them was £75,709. That showed nominally a gain of £60; but, by the resolution passed by the Council to invest £60,000 in Consols, pending an arrangement, a cost of £75 had been incurred, and the actual loss to the town was £15 more than if they had paid the Company in October every farthing of their original demand. The Company had gained everything and the Corporation had given up everything, and had consented to pay perpetual annuities of 5 per cent. from the 24th of June, upon a sum of £1076, which ought properly to have been handed over to the Corporation. It was as clear as the sun at noonday that this £1076 had never been expended by the Company; and the question being whether the Corporation were entitled to it, or whether the Company were to receive a perpetual annuity upon it; and, it being also clear that the Corporation were entitled to the whole amount, it had been simply given up by them. If the Council had not meant really to dispute it, they ought to have at once given way, and not have passed the resolution by which the £60,000 was invested with a view to an arbitration on the difficulty. Instead of going to arbitration, and after having incurred the cost of investing, they had simply dropped into the hands of the Company, and come to their terms. He only made these remarks to show that the arrangement with the Company, on which Mr. Parsonage thought the ratepayers were to be congratulated, really meant that the ratepayers were £15 worse off than they would have been had everything been given up to the Company at first. The bargain was a very unfair one towards the ratepayers; and, at any rate, he thought they should understand the position in which the case stood.

Mr. ONLEY expressed his surprise that Mr. Winterbotham should have made the speech he had done on a question of saving a simple £15. How far would that sum have gone, provided the Company had had to go to law? Nowhere. He believed that had the Council shown a more conciliatory spirit at the commencement of the fray, it would never have gone so far, nor would the expense have been anything like what it would now amount to. He was glad to hear that the matter in dispute had been settled without the intervention of the lawyers, and he would express the hope that, for the future, bygones would be overlooked, and that their utmost endeavour would be, so to manage the water-works as that they should be of the utmost advantage to the town at large.

Mr. LENTHALL said it seemed to him that had the same conciliatory spirit been shown from the first as had been shown during the last month, the Corporation and the town might have obtained possession of the water-works for a much smaller sum than they had now to pay for them. He believed that the Water Committee had been exceedingly jealous of the interests of the ratepayers, and had done their best, by every means in their power, to secure those interests. Mr. Winterbotham had spoken of a loss of £15 which the Council would sustain. But that only showed that if the dispute had gone on longer, the loss would have been greater, and it was a stronger reason in favour of the amicable settlement which had taken place. He should not like to sit down without thanking Mr. Parsonage, as the Chairman of the Committee, for the great pains he had taken in endeavouring to produce and bring about a satisfactory and amicable settlement of the matter. He was sure that whether Mr. Winterbotham agreed or not, the best thanks of the Council were due to Mr. Parsonage for his exertions in the matter; and now that peace and goodwill had been procured, he hoped it would be continued, and a wrangling spirit would form no part in the discussions of 1879.

Mr. STEEL, sen., asked how it was that differential charges, which seemed to be unfair, were to be established—6 per cent. to be charged for the supply of water on properties under £20 a year value, and 5 per cent. on properties above that value.

Mr. PARSONAGE replied that those differential charges were fixed by the Act, and, therefore, were not under the control of the Council. He said that while Mr. Winterbotham had been speaking of a £15 loss, there was a clear loss of some £79 occasioned by the Corporation investing the £60,000, which had been done in consequence of a resolution passed at the Board, and which Mr. Winterbotham himself had seconded.

Mr. WINTERBOTHAM: If the money had not been invested, you would never have had the amicable resolution from the Company.

Mr. PARSONAGE said he was of a different opinion. He believed that had a deputation from the Corporation waited upon the Company in the first instance, the matter in dispute might have been settled as amicably last October, and expense saved. The Company had shown as much willingness and anxiety to settle matters as had the Council, and had met the Council in a gentlemanly, straightforward, and business-like manner. However, he was content to let bygones be bygones, and he congratulated both the Council and the town generally on the satisfactory settlement of the business.

The MAYOR said that he was exceedingly pleased that, in his year of office, so satisfactory a settlement had been arrived at on so vitally important a subject to the town's interest, and he then submitted the resolution, which was adopted unanimously.

We extract from one of the local papers the following particulars as to the past history of the water undertaking in Cheltenham:—

The Cheltenham Water-Works Company were incorporated in 1824. Fifteen years earlier than that, a Mr. Joseph Horwood, engineer, had offered "to supply the whole town with soft river water at one guinea per year each dwelling-house," if "the inhabitants of Cheltenham think it of any utility;" but whether the inhabitants failed to see the "utility" of a water supply then, or had the same objection they afterwards exhibited to the "soft river water," Mr. Horwood was not encouraged to proceed, and the Water-Works Company were founded. The preamble of their Act recited that—

Whereas the town of Cheltenham is at present but scantily supplied with pure water; and whereas the said town has, of late years, become very populous, and is greatly increased in houses and buildings, and is likely to continue to increase; and for the want

of a sufficient supply of spring water for domestic and other purposes, the inhabitants thereof, and persons resorting thereto, are subject to much inconvenience, and would be liable to great danger and most calamitous consequences in cases of accidents by fire; but such inconveniences and danger might be prevented, and much public benefit obtained, if water from the springs arising so near the said town, were conveyed, by means of pipes, to the said town and suburbs thereof.

The share capital created under the Act was £17,000, with a borrowing power of £5000. The Company began with conduits and pipes, and the erection of a reservoir 200 feet above the level of Cheltenham at Hewletts. The first Act comprised merely the town of Cheltenham.

In 1839 another Act was obtained, for extending the Company's operations to Charlton Kings, Leckhampton, Swindon, and Prestbury. By the same Act also, the Company were empowered to construct works at Dowdeswell and Charlton Kings springs. They were also empowered to make an additional reservoir, and they constructed one next to their original reservoir. They created fresh shares, and had fresh borrowing powers.

In 1847 the Company again went to Parliament for increased powers, and they obtained the power to raise £55,625 in shares, and £18,541 on mortgage, making a total capital of £74,166, of which there had been raised, at the date of their next application to Parliament, in 1854, the sum of £50,750; viz., £45,150 by shares, and only £5600 on mortgage, the sum of £23,416 being still unraised. The last Act required the Company to construct an additional reservoir, and they built one capable of holding 15 million gallons of water. At that time the Company were paying 7 or 8 per cent. dividend, but for several years after their formation no dividend had been paid. The passing of the Improvement Act in 1852 was followed in the next year by pressure on the Company to increase their supply of water, the then Borough Surveyor putting the requisite supply at 700,000 gallons daily.

In 1854 application was made to Parliament by the Company for leave to abstract water from the Sierford Spring—a stream, the natural fall of which was towards the watershed of the Thames; but after a contest of exceptional costliness to the Company, the application was rejected, on the ground that the abstraction of water from one watershed by another was wrong in principle, and that the sources of supply to which Cheltenham could legitimately look had not been exhausted.

No further application to Parliament was made until 1864, when the Company were again urged by the town to increase their supply, and negotiations for the purchase of the works by the town at £108,000 having fallen through on a point of detail as to the security for the payment, the Company applied (in 1864 and 1865) to Parliament for power to take a supply of 3,250,000 gallons daily from the Severn. This proposal was strenuously resisted by the town. Passed in the House of Commons, the proposal was thrown out in the House of Lords, and the Company were left with power to supply only Tewkesbury from the Severn, but with the right to take the full quantity of water required under their original scheme.

With the defeat of the Severn scheme, in 1865, active litigation ceased for some years; but the relations between the town and the Company were on a very strained footing. In 1870 a strong effort was made to effect a purchase by the Commissioners, but it was unsuccessful, and similar overtures having also been repelled, and the carrying out of the sanitary requirements of the town being found difficult or impossible, except with the supply in the hands of the governing body, in 1877 notice of application to Parliament for a town supply of water from Dowdeswell Valley was one of the early acts of the newly-established Corporation of Cheltenham. This was met by a renewal of the Company's application for leave to bring water from the Severn, and these two schemes were made, in the spring of last year, the stalking-horses of the fight over the purchase of the Company's works. That fight ended in the Corporation getting their way, though at a heavy cost, and purchasing the works and rights of the Company at a little short of £220,000.

The total expenditure by the Company on capital account up to the transfer was about £120,000, and the property acquired includes the offices, with the house adjoining; land and works used as a pumping-station; the reservoirs, with a storeage capacity of 35 million gallons; the Company's rights over the springs feeding the same; mains throughout the district; and the works at Tewkesbury for the supply of that town and district.

The offices are fitted up with every convenience for their purpose, an apparatus by which the force of water and the variations of pressure, as the turncocks do their duty throughout the day, being one of the most interesting of the fittings. They contain also a somewhat remarkable collection of pipes, &c., showing the effects of various conditions of soil and temperature on their composition.

The offices are, as it were, the head of the complex system constituting the water-works service; but the main portion of the works are the reservoirs, five in number, on Hewletts Hill (in Charlton Kings parish), and in Leckhampton. On Hewletts there was originally only one reservoir, with a capacity of 70,000 gallons, which met the first needs of the Company; but this was soon followed by a second reservoir, to hold 2 million gallons; and, by the development of the works since, the total capacity has risen to 35 million gallons, contained in five reservoirs, four of which are on Hewletts (two being covered), and one on Leckhampton, which supplements the supply from Hewletts, and is fed from what is known as the Pilford Spring, taken some years ago by the Company. The area of the Hewletts reservoirs is about 20 acres, and the water is conveyed thence in mains of 12-inch, 8-inch, and 6-inch diameter, and so distributed through the town by mains, independent of the house service-pipes, about 70 miles in length. The total cost of the reservoirs has been £42,000, which, for a storeage of 35 million gallons, gives the very high rate of nearly £1250 per million gallons. The reservoirs are situated on a lovely spot on the side of the hill, commanding a fine view of the valley; and they are at a height sufficient to command the top of the highest building in Cheltenham, and to give a pressure of about 200 feet throughout the district.

The pumping-station in Sandford Mead is subsidiary to the reservoirs at Hewletts. It was formed for the purpose of pumping a supplementary supply from the town sand-bed, and is fitted with duplicated engine power, capable of pumping 250,000 gallons daily into the reservoirs at Hewletts, where it is "blended" with the spring water, and delivered with it to the town; but this source of supply is now rarely used, and, under the Corporation, will, probably, be abandoned altogether.

The works at Tewkesbury are at present used only for the supply of that borough and Ashchurch; but, with the works, the Corporation obtain a right to abstract 3,250,000 gallons of water daily from the Severn, of which quantity only 120,000 gallons are at present taken. Whether the powers thus held will be utilized by the Corporation for the supply of Cheltenham, on the separate service system, remains to be discovered; but that there are advantages to be obtained from so plentiful and soft a supply, for sanitary and culinary purposes, is self-evident.

The works are a little distance out of the town of Tewkesbury, near to the Mythe Bridge and "tute," the intake from the Severn being almost under the shadow of the bridge. They were erected in 1869, and are very prettily placed and laid out. They comprise an engine-station with workmen's residence, the necessary tanks, &c., and on the Mythe Hill, a large water-tower; and, in connection with these, the Company have handed over about 5½ acres of land purchased, for the projected development of the works. The two 8-horse engines are pictures of what well-kept machinery may be, and are fitted with every possible appliance for saving labour, economizing fuel and power, and recording the work done. By these engines the water is pumped into a subsiding-tank, the outlet of which, though 60 feet distant, is nearly level with the inlet, so as to secure a perfect subsidence before the water is taken onward to the filters. Through these it passes into a covered reservoir, whence it is again pumped into the tank of the water-tower on the Mythe Hill, and is thence distributed through the town of Tewkesbury, and to the Midland station and stores at Ashchurch. The water-tower is a massive, though far from an unsightly building, in the Moorish style, and it, like the whole of the works, was designed by Mr. William M'Landsborough, the Manager and Engineer. The cost of the works at Tewkesbury has been £9000, three-fourths of which, we believe, has been paid out of the revenue of the Company.

As to the future of the works, their profit to the town would appear to depend on obtaining such an additional supply, whether from the hills or the Severn, as will meet the requirements of the entire district. There still remains a population and rateable value of little less than those of Gloucester, wholly unsupplied by the works, and yet within the area of service. In the Cheltenham district there are nearly 11,000 houses, of which 3700 only are served, leaving 7200 unserved—chiefly, it is true, of the poorer class, only to be reached by an abundant and constant supply. In Tewkesbury, 200 houses are supplied out of about 1300. The total rateable value of the two places is £301,146, of which £168,000 is supplied, leaving about £133,000 still to be worked on. If a large proportion of this could be reached, as it might be, on the constant-service system, a further expenditure of £80,000 or £90,000 upon extension works might be made, and a profitable return given upon the whole capital of the works—then about £300,000. But if the works go on as at present, with the charges for supply subject to the deductions which the Corporation Act allows on the old charges of the Company, there must inevitably be some charge on the rates, though even then not more than is fairly chargeable, seeing that the works, when paid for, will be the property, not of the consumers only, but of the ratepayers at large.

DR. TYNDALL ON THE ELECTRIC LIGHT.

On Friday evening last, at the Royal Institution, Dr. Tyndall lectured to an overflowing audience on the subject of the electric light.

In a few opening remarks, the lecturer stated that the subject had been suggested to him by the late Secretary of the Institution, Mr. W. Spottiswoode, now President of the Royal Society, in order that "a few solid thoughts" might be contributed to a matter of considerable public interest at the present time. Commencing with the voltaic pile, the principles of the galvanic battery were described and illustrated, and it was shown that, in order to obtain the manifestation of heat and light from the electric current so generated, it is necessary to interpose some form of resistance in its path, in the overcoming of which the electric energy is changed into the energy of heat. The electric light has been obtainable from a galvanic current for more than half a century; but the great drawback to its use has been its great expense. A piece of a metal, such as zinc, is capable of burning, or becoming oxidized, very much in the same way as other varieties of fuel, and the amount of heat generated is a fixed and definite quantity, no matter whether the zinc is burnt rapidly in a fire, or whether it is burnt slowly, as in the case of its solution in an acid, which is the action taking place in a galvanic battery. In the latter case, however, only a fraction—about one-fifth—of the potential energy of the zinc can be rendered available for the production of light and heat by the electric current. This obtained, the remaining four-fifths are partly carried away in the form of the combustible gas, hydrogen, which escapes from the battery, and is partly manifested as heat in the cells of the battery itself. These facts seem to preclude the idea that the galvanic current can ever be an economic mode of obtaining the electric light, and had no cheaper method been forthcoming for developing the electric force, it is hardly possible that artificial illumination by its means would ever have been attempted as a commercial speculation. It was, however, within the walls of the Royal Institution that the great discovery was made by Professor Faraday of "electro-magnetic" induction. This discovery of the fact that, if a closed coil of insulated wire be moved when in proximity to a magnet, a current of electricity is found to traverse the wire, is one of those germs, the fruition of which goes far beyond any conception which can be formed at the time it is made. Dr. Tyndall quoted Faraday's own words to show that he regarded it as the beginning of a new era in electrical discovery. Faraday did not, however, seek to develop and exalt the effects which he had obtained, but preferred pursuing his course in the discovery of new facts and principles; being, as he said, perfectly assured that others would ere long seek to apply practically the discoveries he had made. In this he was quite correct; for very shortly several machines were introduced for obtaining a current of electricity by the rotation of a coil of wire in front of a series of magnets. Some of these early machines were exhibited on Friday evening, but they are mere toys as regards the effects produced, in comparison with the modern form of dynamo machine. In the first machines, permanent magnets were used; afterwards it was found that the residual magnetism in a piece of ordinary iron was sufficient for the purpose, and that if the weak current first obtained was sent round such a piece of iron, its magnetism was thereby increased, and this tended to produce a stronger current, which again exalted the power of the magnet, and so on, until the maximum effect was produced. Improved methods for winding the coil of wire, and the manner of causing it to rotate in close proximity to the magnets, form the chief improvements in the late machines. Many of these machines were described by Dr. Tyndall, including those of Holmes, Wilde, Gramme, Siemens, Wallace, Farmer, and De Meritens. Dr. Tyndall paid a special tribute to Mr. Holmes, as being one of the earliest to introduce a really serviceable machine.

Passing from the machines, Dr. Tyndall referred to the manner in which the light is usually produced—*i.e.*, by the passage of the electric current between two carbon rods, separated by a small space of air. The gradual wasting away of the carbon, necessitating some method of automatic adjustment, has led to the introduction of various arrangements. In the lamps of Foucault, Serrin, and Siemens, this is done by a system of clockwork; in those of Rapieff, Werdermann, and Wallace, by simple pulleys and balance-weights; while in the Jablochkoff candle, two rods of carbon are separated by a small slice of kaolin, and the electric arc leaps across this interval, and causes the carbons to burn down like a candle. The carbon in connection with the positive pole of the machine burns more rapidly than that in connection with the negative; this has to be corrected by giving to the carbon a greater speed of motion. In the Jablochkoff candle the current is reversed some thousands of times in a minute, and hence the carbon burns down uniformly. A new form of lamp was exhibited, the invention of Dr. Siemens, in which, by keeping the negative carbon cool by means of a stream of water, its wasting away is prevented.

A number of these lamps were shown in action, three machines—

a Siemens, a Gramme, and a Wallace-Farmer, the two latter worked by an Otto gas-engine, being stationed in the lower part of the building. The theatre during the evening was illuminated by the Siemens lamp. Mr. Ladd showed a very fine effect produced by raising to an intense white heat a small bar of iridium, a more refractory metal than platinum, by the Wallace-Farmer machine. The bar was about 3 inches long, and the light was sufficient to illuminate satisfactorily the whole of the Royal Institution theatre. A few other lamps, based upon the system of illumination by incandescence, were also on the table.

In concluding, Dr. Tyndall referred to the success which had attended the use of the electric light for lighthouse purposes, and expressed a hope that the time was not far distant when the "spark of Faraday would illuminate our open spaces, streets, and squares, and possibly our houses."

THE ELECTRIC LIGHT AT WESTGATE-ON-SEA.

Report by Messrs. W. H. Bennett and W. A. Valon.

Edmund F. Davis, Esq., St. Peter's, Isle of Thanet.

Sir,—Having received an intimation from you, in the middle of September last, that you were desirous of having an exhibition of the electric light upon your estate at Westgate-on-Sea, with the view of ascertaining whether the light is practically adapted to public lighting, and its cost, and, having subsequently received from you instructions to make arrangements for such an exhibition, we put ourselves in communication with the representatives of the various systems then before the public.

The system at that time attracting public attention the most was one that apparently displayed the greatest power of light per lamp, and to its agents we therefore resorted. Upon making known our wishes, we were informed that such an exhibition would be very expensive, that they were inundated with applications of the same kind from all parts of the country, that they had no machines at liberty, that the machines were being made in France, and that they expected to receive 50 of them in the course of that week, and that possibly, if we applied again in a fortnight, they would be in a position to entertain the application. Accordingly, after a lapse of a little over a fortnight, we again waited upon them, when another representative repeated in the blandest manner almost the identical story we had heard before, with this variation, that if one of us would call again at the end of a week, it was possible they might be able to say something more definite. After considerably more than a week, one of us did call again, to hear a repetition of the previous narration in somewhat more shadowy terms. In the meantime, we had applied to the representatives of other systems. On stating our wants to the one of these, whose light appeared to possess features more recommendatory than either of the others, we were very courteously and candidly told that, while the inventor would be most happy to invite us to witness experiments about to be exhibited, the details for making the invention applicable to a number of public lights were not sufficiently advanced to justify the acceptance of such an engagement. On applying to the agent of another system, we were met with a refusal in terms so curt as to leave us in painful doubt as to whether it was the greatness of the invention or the agent that induced such a display. It would have been unnecessary to enter upon these particulars, but for the apparent great loss of time in carrying your instructions into effect. However, we ultimately arranged, with your consent, for the supply of machines, cable, six electric lamps upon the Jablochkoff candle principle, all the electrical appliances connected with the proposed exhibition, and the requisite attendance, you supplying motive power and such local assistance as would be needed.

The site selected by us, and approved by you, for the exhibition of the lamps is called the Sea Road, which runs between the ornamental gardens in front of the sea on the one side, and a number of villa residences on the other side. Here the positions of six lamps were marked out, the first being placed at a point where four roads meet, and the rest at a distance of 80 yards apart from each other, the distance between the two extreme lamps being 400 yards. Lamp-posts, 9 ft. 6 in. in height, corresponding to these positions, were therefore erected close to the railings of the ornamental gardens. An unoccupied building site on the residential side of the road, next to the premises of the Westgate Club, and situated about midway between the extreme lamps, was taken advantage of for the erection of an engine-shed, in front of which a portable office, used by the Clerk of the Works on the estate, was placed, and converted into a very convenient room for the reception of the machines. A portable steam-engine, with horizontal boiler, and of 10-horse nominal power, made by Messrs. Garrett and Co., was temporarily fixed in the engine-shed, and a countershaft, with suitably sized riggers and bands to give the requisite velocities to the machines, was firmly secured to a foundation prepared for it. The two Gramme machines employed are now sufficiently well known to need no description of their details here. Suffice it to say that the small one was used to produce a direct current to excite the large or alternating current machine, the latter being of the size known as a six-light. The arrangement of the machine is such that two distinct and separate currents can be drawn from it, and as it is desirable that the circuits shall be as short as possible, and being anxious to make the experiments a success, we determined to divide the current, and use two circuits, putting three lamps upon each circuit. The cables leading from the commutators in connection with the machines were taken in 2-inch pipes, laid beneath the surface of the road, to the two nearest lamp-posts, the cable or wires connecting one lamp to another being laid on, and attached to the railings of the ornamental gardens before referred to; the return wires following the same course back to the machine. The lamps were similar to those used in Paris to light the Place de l'Opéra, the Avenue de l'Opéra, the Magasins du Louvre, &c., each being adapted to receive four electric candles, and each candle being alleged to be capable of burning an hour and a half. One man was engaged to drive the engine, and another, specially qualified, to look after the machines and attend to the lamps.

On the 30th of November the arrangement of apparatus and lamps was, though not complete, sufficiently advanced to make a preliminary trial, and three lamps were lighted, and continued to burn for an hour or two successfully.

On Monday, the 2nd of December, a party of gentlemen connected with the London and Provincial Press, and others interested in the subject, assembled in front of the engine-shed, and at a quarter past five o'clock the whole six lamps were lighted almost instantaneously. The effect was most gratifying, and from this moment the experiment may be said to have commenced.

The lamps continued to burn brightly till eight o'clock, when the three on No. 1 circuit were suddenly extinguished, and, on the attendant going to examine No. 1 lamp of that circuit, he found the wires were disconnected from the binding screws immediately below the globe. It is presumed that some one, prompted by more curiosity than wisdom, fingered or pulled upon these wires until one became disconnected, when the continuity of the circuit was temporarily destroyed, and the whole of the lights on it, of course, went out. An attempt was made by the attendant to relight the lamp by diverting the current to another candle; but, on putting the key into the commutator-box, he received such a shock that the key was jerked to the other side of the road. The Manager of the gas-works at Birchington, that supplies Westgate, was present, and endeavoured to re-adjust the current, but received several shocks sufficiently strong to impress him with the desirability of postponing further effort until daylight would lend its assistance for the replacement of the wires. Owing to the inability of the attendant to be in two places at once, and to the mishap just mentioned, he omitted to shift the current from the expiring candles to fresh ones on No. 2 circuit, and the consequence was that at 8.30 they went out too. The evening being so far advanced, it was not thought worth while to relight either series.

It is unnecessary, in a report of this kind, to give the particulars of each night's burning, and we, therefore, summarize them by saying that the lamps were continued alight generally for four hours per night for 24 nights, and, with the exception of Sundays, Christmas Day, and the following day, consecutively. The total number of hours during which the lighting was continued was 93½. This is equivalent to a little over the time that gas lights would be burning for six nights at the present season of the year. The time during which the lights should have continued burning was 96 hours, the difference being due principally to the charge of four candles not lasting the full time of four hours per night. It is desirable here to mention that, although it is alleged each candle will burn for an hour and a half, and, although it has been found that, on some occasions, they will last that time, still, in practice, in order to reduce the liability of the candles being extinguished, it was found unsafe to neglect the changing them nearly every hour. This precaution, however, was not sufficient to prevent the lights from going out incidentally, and upon eight occasions this effect took place. We are inclined to think that this was due mainly to faults in the candles, and we are fortified in our supposition by those who have had more experience, that at times minute cracks will occur in the carbons, either in their manufacture, packing, or transmission—that these cracks are almost imperceptible, but when the candle has burnt down to near the fracture, the energy of the current, instead of throwing off the carbon in minute particles, forces off a piece of such magnitude as to increase the distance between the carbons, and the resistance thus occasioned is more than the current will overcome, consequently the arc is destroyed, and the light fails. It is quite certain that, however much the carbons have been improved, their homogeneity is still defective; for, while continuing to burn, one frequently perceives pieces of carbon thrown off from the candle to the bottom of the globe, and this always occasions a considerable variation in the light. The number of candles used in the 24 days was 586; but we are inclined to think that, if we had been upon the spot the whole time, some economy might have been effected in this respect.

The disadvantages arising from a sudden failure of any one light are, firstly, that the whole of the lights on that circuit are extinguished, and although they may have been burning but a few minutes, the necessity for changing to fresh candles is imperative; the candles only thus partially burnt become useless, and as a consequence increases the expense of this system of lighting. Secondly, the attendant, though engaged at one extremity of his district, may be compelled to go immediately to the other for the purpose of changing the candles, and until the whole of the candles in the faulty circuit are changed, and the continuity of the current completed, absence of light must be the result. In your case, where the distance between the extreme lamps was but 400 yards, the inconvenience was comparatively trifling; but, even there, such a change involved continued darkness for five or six minutes, and it is not difficult to predict many of the dangers that would arise from a crowded thoroughfare being kept in darkness for even five or six minutes. Of course, the more the number of lamps on each circuit is increased, and the longer distance the man has to travel, so will this evil be augmented. It is true that it is possible to place the man centrally, and give him command over the whole of the lamps from this point, but the great cost of providing cable sufficient to make this plan practicable renders its adoption almost prohibitory. As it was, over 1190 yards of cable were used. Nothing, however, will prevent the necessity of an attendant having to visit the lamps every four or five hours to insert fresh candles.

You will perceive, from the foregoing, that to light a town, or any large area under this system it would be necessary to have a considerable number of stations, each of which would have to be provided with complete machinery and apparatus. Nor is this all, for it is equally imperative that the whole of the machinery should be provided in duplicate, because machines of every kind require repair from time to time, and a failure of even an hour's service would never be tolerated by the local authorities or the public. We are aware that commentators upon this system have never insisted upon the necessity for furnishing the apparatus in duplicate, and the promoters of electric lighting say it is not needed; but those who are better acquainted with the requirements of public lighting know that it is absolutely indispensable. Even with duplicate machinery and apparatus, unless an arrangement could be made so that the stopping of any machine should automatically set the substitute in motion, all the lights in connection with that machine would be extinguished.

The steam-engine, as before stated, was a portable one, of 10-horse nominal power, with a horizontal boiler, and having a cylinder 12 inches in diameter and 12 inches stroke. It was worked with an average pressure in the boiler of 53½ lbs., and made 126 revolutions per minute. This gave a velocity of 959 revolutions per minute to the large machine, and 1263 to the small one. Towards the close of one evening's experiment, the governors were thrown out of action, and the full force of the steam in the cylinder was intentionally and gradually lowered to 21 lbs., when the lights went out. On another occasion, when a similar experiment was made, the lights went out when the steam had been lowered to 25 lbs. We must regret that the engine was not adapted for the application of an indicator, whereby the actual indicated horse power required to drive the machines might have been ascertained. It is, however, evident from the above that the full nominal horse power was absorbed; and it is to the abundance, though not superabundance of the power at our disposal that we attribute, in a great measure, our success in keeping the lamps so constantly alight.

As one of the objects of this exhibition was to determine the cost of this method of illumination in comparison with that of gas, as ordinarily employed, it became our duty to ascertain the illuminating power of the electric light. To do so fairly, we resolved to make the experiments *in situ*. Accordingly, lamp No. 6, the last in No. 2 circuit, was selected, it being more conveniently situated for such a purpose. At a distance of 84 feet from the electric light, and at nearly right angles to the general line of the electric lamps, a lamp-post of the same height was erected. To this was fitted an ordinary 14-inch lantern, furnished with a perforated zinc bottom, and provided with an arrangement within for the prevention of undue draught. One of Sugg's Argand burners was selected as a standard, and was tested in the lantern in which it was to be employed. With gas at a pressure and of the quality at our command, we found it yield a light equal to 25 candles, as indicated on the photometer-bar, and subsequently corrected. It is possible that some may object to this standard, on the ground that it is evident that we did not burn the gas to the greatest advantage. This we foresaw, but it was quite immaterial for our purpose whether the standard gave 25 or 50 candles, so long as we preserved an uniform and steady flame, and knew precisely what the value of our

standard was, and we therefore adhered to it. A stationary platform was erected in a line with the two lamps, graduated into feet and inches, and upon this platform was a smaller and moveable one. On the moveable platform was placed a modification of Leeson's star disc, 10 inches square, and made specially for the purpose, surrounded by a blackened wood screen, but open at the ends, and with an opening also in front through which to view the disc. The screen was mounted upon wheels that ran upon rails fixed to the moveable platform, and had fastened to it a pointer that descended to the stationary platform, and in front of the graduations. The moveable platform thus served for a rough adjustment, while the disc was capable of being removed to and fro, and adjusted with great nicety.

The lanterns or globes first supplied were 17 inches in diameter, and subsequently several additional ones were sent, in case of breakage; amongst these was one of 20 inches. Breakage of the globes did take place, and so long as we had 17-inch ones to replace them, we maintained uniformity; but ultimately we were obliged to use the 20-inch one, when there was such a manifest increase in the quantity of light from the larger globe, that it attracted the attention of almost every observer. We, therefore, applied to the light to be tested the 20-inch globe. The average illuminating power was ascertained, from a great many readings, to be equal to 197 candles, the variations, which were incessant, ranging from 192 to 207. We also tested the light with the 17-inch globe, but the results were so inferior in power that we rejected them as unfair for comparison. We are sorry that at no time when we were present, and prepared to take the illuminating power of the naked light, could we do so, on account of the violence of the wind; in fact, the whole of the time during which the exhibition lasted the weather was very inclement. Although the wind did not actually put it out, the light was so reduced that any attempt to test it would have been useless. This, though a matter of regret in some respect is of no very material importance, since all comparison between it and gas for public lighting purposes must be made with the electric light covered, because the light without such a softening and diffusing medium would be, if not insupportable, at least most disagreeable to the eye.

We now approach the subject of cost, and propose to show the actual working expenses you would have had to pay for the 24 days exhibition, supposing that you had to pay each item yourself, instead of paying an agreed price to a contractor—

	£	s.	d.
Fuel for engine	£7	1	2
Water		3	6
Oil		10	0
586 candles, at 8d. each	19	10	8
Engine driver, 5s. per day for 24 days	6	0	0
Machine and lamp attendant, 6s. per day for 24 days	7	4	0
Total working expenses	£40	9	4

for maintaining a light of 1182 candles for 93½ hours actually, but say 96 hours.

Now, supposing the same light had to be obtained from gas for the same time, and suppose the price charged for it was 6s. 6d. per 1000 cubic feet, as at Westgate, we shall find (assuming that 5 feet of gas, of the quality supplied there, burned in an ordinary street lantern, gives 11 candles) 1182 candles divided by 11 is 107½, or the number of gas-lamps necessary to equal the six electric lights.

Therefore . .	107½	lamps
Multiplied by	5	the number of cubic feet consumed per hour,
	537½	
Multiplied by	4	the number of hours per night,
	2150	
Multiplied by	24	the number of days,
	8600	
	4300	

Produces . 51,600 cubic feet of gas, which, at 6s. 6d. per 1000, comes to £16 15s. 4d., and would be the cost of exhibiting an equal amount of light to that produced from the six electric lamps for the same time—£16 15s. 4d. for gas, as against £40 9s. 4d. for electricity.

Although it may be perfectly justifiable to charge 6s. 6d. per 1000 for gas at Westgate, it must be admitted that that price is a very high one. Had the experiment been made in London, the following figures for gas, in comparison with electricity, would have been the result:—Gas being of higher quality in London than at Westgate, 94½ lamps would yield an equivalent light—therefore, 94½ × 5 × 4 × 24 = 45,360 cubic feet, which at 3s. 6d. (the average price in London), would be £7 18s. 9d. for gas, as against £40 9s. 4d. for electricity.

It is a curious fact, and one well worthy of remark, that had the cost of the fuel, oil, and water—namely, £7 14s. 8d.—been expended in gas at the average price charged in London, it would *very nearly* have purchased an *equal* amount of illumination.

Let us see now what would be the cost of establishing and working six electric lamps for one year, of 4327 lighting hours, upon the basis of the first figures quoted above:—

	£	s.	d.
Boiler-house, engine, and machine-room	£300	0	0
10-horse engine and boiler	300	0	0
Duplicate	300	0	0
Pair of Gramme machines	220	0	0
Duplicate	220	0	0
Cable, 1100 mètres (*i.e.*, 1190 yards), at 2s. per mètre fixed	110	0	0
6 lanterns, with their accessories	60	0	0
6 lamp-posts	12	0	0
Total	£1522	0	0
10 per cent. interest on £1522	£152	4	0
10 per cent. depreciation on £580, the cost of one set of machinery and lamps	58	0	0
Fuel	318	2	9
Water	7	17	9
Oil	22	10	8
26,412 candles, at 8d.	880	8	0
One man, to drive engine and attend to the machines, at 6s. per day	109	10	0
Attendance to lamps, at 5s. per day, upon the supposition that one man could attend to 20 lamps	27	7	6
Cost of supplying 6 electric lights for one year of 4327 lighting hours	£1576	1	3
Or 14·56d. per light per hour.			

This includes no allowance of interest for working capital, or depreciation of buildings or cables.

It may be well to observe here again that the promoters of the Jablochkoff system state that each candle is calculated to burn an hour and a half. We have not found this borne out in practice; but assuming that they would do so, the candles would still cost no less than £535 15s. 4d.

On turning to see the cost of supplying the same illuminating power with gas, we shall find the 1182 candles, or 107½ lamps, multiplied by 5 cubic feet, multiplied by 4327 lighting hours, gives 2,325,762 cubic feet, which, at 6s. 6d. per 1000, the price charged at Westgate, comes to £755 17s. 4d. Add to this, 13s. per lamp per year for lighting, cleaning, and repairing, £69 17s. 6d., and we have £825 14s. 10d., or above £54 less than it would, according to our experience, cost for electric candles alone.

This same amount of light for the same time, at the average rate charged for gas in London, including lighting, cleaning, and repairing, would amount to only £427 13s. 3d., and, by the apparently improved system about to be inaugurated, probably less.

Before quitting this part of the subject, it is only right to draw attention to the fact that, while we can measure very accurately the intensity of any given light, there is no known means of measuring its quantity. Now, the electric light, is a light of great intensity, but possessing very little quantity; and, as quantity is a necessity for good illumination, it is almost impossible to draw a correct money value comparison between electricity and gas. It needs no technical or scientific knowledge to see that, if 1182 candles, or their equivalent, 107½ gas-lamps, had been spread over the same area as the six electric ones were, there would have been a far more brilliant and agreeable illumination than existed during our experiments. We should have been glad to have demonstrated more fully the merits of gas in comparison with electricity, and were prepared to submit to you a plan for that purpose; but the unfavourable time of the year would not warrant such an expense as would have been entailed, and we therefore abandoned the idea until a more suitable season.

In drawing the report to a close, we would remark that, while the exhibition of the electric light at Westgate, as an electric light, has been most successful, and every effort has been made by us to give the system the fairest possible trial, we say, with the greatest confidence, that this method is surrounded by so many practicl difficulties, that no amount of improvement is likely to fit it for general adoption. The liability of the machinery to derangement at any moment, the defective character of the candles, the incessant variation of the illuminating power, want of diffusibility and means of storeage, the constant care and attention the lights require, and the enormous cost of producing the light, all unfit it for a general public illuminating agent. We have seen all the systems that have been introduced within the last 18 months, and we have no hesitation in stating that, if electricity is to be the light of the future, it must be produced by a radically different system to any yet brought before the public—a system, in our opinion, that remains undiscovered.

We trust that the public, and especially those who are connected with gas, will appreciate the spirit you have shown in affording an opportunity for investigating this method of illumination—an investigation that has materially assisted us in coming to the conclusion, that the introduction of the electric light, though destined to survive but a short time, will go far to promote the increased use of gas, and consequently the prosperity of gas interests.

We are, Sir, yours faithfully,

W. H. Bennett.
William A. Valon.

22, *Great George Street, Westminster, S.W., Jan.* 17, 1879.

ON SOME FURTHER APPLICATIONS OF ELECTRICITY TO THE PUBLIC LIGHTING OF PARIS.

Report presented to the Municipal Council of Paris by the Lighting Committee.

[Translated from *Le Temps*.]

Gentlemen,—By a memoir dated the 26th of November last, the Prefect of the Seine submitted to the Municipal Council a communication from the Compagnie Générale d'Electricité, in which that Company asked for a concession, for a period of three years, of the lighting of a group of streets and public open spaces by means of the system of electric lighting known as the Jablochkoff.

In a former report, bearing date the 30th of November last, we have already briefly made you acquainted with the bases of the propositions made by the Jablochkoff Electric Light Company. As a result of its perusal, you authorized provisionally the continuation of the trials of the electric light up to the 15th of January, in all the localities where, by virtue of your previous decisions, it had already been applied, in order to afford your Committee the necessary time for studying the applicability of the light for general public illumination.

In order to carry this out, your Committee had at their disposal the very detailed reports of M. Th. Lévy, the General Engineer of the 1st section of the Municipal Service; MM. Allard and De Fontanges, Engineers-in-Chief; and M. F. Leblanc, the Official Gas Examiner—reports which were annexed to the memoir of the Prefect of the Seine. Comprehensive as these reports were, they appeared to us insufficient, having in view the work we were about to undertake, and we therefore desired to give a completeness to the information that had been already furnished, by calling before us in succession the City Engineers and the Representatives of the Compagnie Générale d'Electricité and the Paris Gas Company.

These gentlemen very promptly responded to our appeal, and answered every question put to them. The information your Committee thus acquired forms the basis of the report they now have the honour of presenting to you, which is arranged in three sections, the first being devoted to an examination of all matters relating specially to electric lighting, such as a description of the different apparatus employed, their mode of working, &c.; the second treating of the comparative indications of the illuminating powers or relative intensities of the electric light and gas; and the third forming a summary of the facts observed, so arranged as to facilitate the deduction from them of conclusions consistent with the nature of the recommendations which your Committee deemed it their duty to make.

I.—*Electric Lighting and its Mode of Operation.*

Every application of electric lighting by the Jablochkoff system necessitates the use of (1) motive power, for imparting an excessively rapid rotatory motion to the magneto-electric machines; (2) one or several of such machines; (3) a network of conducting wires for the transmission of the electric currents from the machines to the electric lamps; (4) one or a number of such lamps.

The motive power necessary for driving the magneto-electric machines should generally be 20-horse power for 16 lamps, or 1·25-horse power per lamp. The Electric Light Company hope, however, to be able to considerably reduce the amount of power required, as recent experiments justify them in asserting that it may be brought down to one-horse power for three lamps. Under these circumstances, an ordinary Lenoir gas-engine, of 4-horse power, would suffice for the supply of 12 lamps. At present, however, we cannot reckon upon this reduction of power, and, consequently, of expense, which is about 55 c. per horse power per hour, or for a single lamp 55 c. × 1·25 = about 69 c. (6·9d.) per hour.

By means of the magneto-electric machines, the electric currents are generated, and then transmitted to the lamps. The machines at present employed in lighting the Avenue de l'Opéra are Gramme machines, consisting of an electro-magnet in the form of a ring, which transmits its generated current to a second machine, called the "light machine." The

number of revolutions performed by the Gramme machines per minute is 600, and the currents successively transmitted by means of the eight induction coils, properly arranged for the purpose, are $8 \times 600 = 4800$ in one direction, and 4800 in the contrary direction.

The conductors are intended to convey the currents from the magneto-electric machines, and distribute them to the different lamps fixed in the localities required to be lighted. They consist of a cable composed of seven strands of copper wire steeped in a composition of gutta-percha, and surrounded with a coating of caoutchouc covered with impermeable canvas. The conductors are protected from damp by being laid in securely cemented earthenware pipes.

The electric lamps consist of one or several of the Jablochkoff candles, each being composed of two small sticks of carbon placed side by side, having between them a layer of insulating material composed of plaster of Paris and sulphate of baryta. By means of an armature placed at the base of the candle, and specially contrived for the purpose, the positive and negative currents from the electro-magnets are conveyed to the points of the carbons, these producing a luminous voltaic arc, which juts out between the two carbons, and thus produces a light which lasts as long as the candle remains unconsumed, but always on the condition that no interruption in the transmission of the currents takes place. Such interruption may occur from various causes, notably from some accident happening to the engine supplying the motive power, or to the machine for transmitting the currents; but it may simply result from a defect in the working of the commutators,* or some slight damage the conductors may have sustained. When this interruption takes place, there is an extinction of the light, which may be either partial or total, according as the transmission of the electric current to one or more of the candles, or to the entire number, is arrested.

In the Avenue de l'Opéra some carefully made observations established almost conclusively the number of extinctions that took place, and also their duration and cause. From May 30 to Oct. 10, 1878, there were 60 extinctions, which lasted for periods varying from 1, 2, 3, 5, or 10 minutes, to 15, 30, 35, and even 45 minutes. These extinctions generally occurred in 4 lamps at a time, but occasionally in 14 or 16, the total number of lamps employed being 62. There is really no means of ensuring complete immunity from these causes of extinctions. The Electric Light Company hope, with time and experience, to succeed, as they have done before, in gradually reducing the number. It must, however, be acknowledged that absolute regularity in the action of the electric light cannot be reckoned upon.

II.—*The Illuminating Power of the Electric Light.*

The light produced by a Carcel lamp, burning 42 grammes of purified oil per hour, is generally taken as the unit of illuminating power. In comparing the light of a Carcel lamp with that furnished by an ordinary Paris standard burner, consuming 140 litres (5 feet) per hour, it is found that the light given by the latter is equal to that of the Carcel lamp, *plus* 10-100ths; in other words, the illuminating power of an ordinary gas-burner is equal to 1·10 Carcel burners.

The light produced by a Jablochkoff candle has been almost exactly determined by the experiments of M. Th. Lévy, as well as by the testings made at the works of the Electric Light Company, in the Avenue de Villiers, by M. Félix Leblanc, the Official Gas Examiner, on behalf of the City of Paris. These experiments showed that an electric light gave at the works an illuminating power equal generally to 80 Carcel burners; but as the light cannot be employed for illuminating purposes except by moderating its brilliancy by means of opaque globes, its lighting power is reduced to 18 or 20 Carcel burners when tested on a line horizontal with the light, and reduced to the value of 12·10 Carcel burners for lighting the pavement—that is to say, when the oblique rays of light that fall upon the ground are tested.

As will be seen, a considerable amount of light is lost by the passage of the luminous rays through the opaque globes, and it is to reduce this loss of light that the greatest possible efforts must be made. The representatives of the Electric Light Company have assured us that all their energies were being directed towards the attainment of that end, and that they had been very nearly successful.

It results from the preceding statements, that an electric lamp throws upon the ground a light equal to 12·10 Carcel burners, while the amount of luminosity supplied by an ordinary gas-burner is equal to only 1·10 Carcel burners. This shows that an electric light is equivalent to 11 ordinary gas-jets, as $11 \times 1{\cdot}10 = 12{\cdot}10$.

But, on the other hand, the Gas Company have informed us that if the consumptive capacity of a burner were enlarged, its illuminating power would be very considerably increased. Thus, a burner consuming 200 litres (7 cubic feet) per hour would furnish a light, the illuminating value of which would be represented by 1·72 Carcel burners. It will thus be seen that, in this case, an electric light would only be equal to seven of the improved gas-burners. The Gas Company's representatives also assured us that they were quite at our disposal in the matter of any trials of an improved system of gas lighting which the Municipality might wish to make, whether by increasing the rate of consumption of the burners or by altering the arrangements of the lamps.

We profited by the opportunity afforded us by the presence of these gentlemen and the City Engineers to put to them a question on a subject which seemed to engage the attention of certain members of the Council—viz., the possibility of finding a more or less exact method of measuring the quantity of gas consumed. They replied, with all the authority and knowledge of the subject which distinguishes them, that the regulators employed up to now were all imperfect, and eminently unfit for determining the customary daily consumption of gas in the public lamps. The case of the City of London, where regulators are employed, is not, it appears, by any means conclusive. The best plan at present known—and it is a very imperfect one—is that of comparing the light of a gas-burner with a photograph of the flame of a well-regulated burner, taken in the testing-room.

Although the Gas Company's representatives assured us that this question interested their Company much more than the Municipality itself, seeing that the former, according to M. Leblanc and the Engineers, supplied a quantity of gas in excess of, rather than the exact amount they were bound to furnish, we urged upon them the desirability of pursuing the scientific researches destined to determine exactly the amount of gas consumed, in order to meet the wishes of a large number of the members of the Municipal Council.

III.—*Summary and Conclusions.*

Having collected all the information detailed in the former part of this report, your Committee took into their consideration whether, in the present position of affairs, they could recommend you to agree to the proposal made by the Electric Light Company for a grant of the concession of the public lighting for a term of three years, as set forth in the following letter, which we beg to lay before you:—

Paris, Nov. 19, 1878.

M. l'Ingénieur-en-Chef,—I have the honour of sending you the particulars relating to the project, respecting which I consulted you, for the lighting by electricity of several of the public thoroughfares of Paris.

The Société Générale d'Electricité, whom I represent, would undertake to fit up at their own expense, in the several places indicated in the project—viz., the Avenue and Place de l'Opéra, the Place du Théâtre Français, the Place and Boulevard de la Madeleine, the Boulevard des Capucines and the Boulevard des Italiens, the Rue Vivienne, the Place de la Bourse, the Rue du Quatre Septembre, the Rue de la Paix, and the Place Vendôme—156* electric lamps, dispersed in accordance with the plans already submitted to the several district Engineers, and under the following conditions:—

In those places where it would be possible to do so, without interfering with the lighting by gas—notably, on the refuges already existing in the public thoroughfares—the lamps and other property belonging to the City would be utilized for carrying the electric lighting apparatus. In those places where the addition of a candelabra would be necessary, it will be supplied by the Société Générale d'Electricité, in accordance with a pattern submitted to the Administration, and approved by them.

The price per hour of lighting, commencing at the usual time—that is, at dusk—and terminating half an hour after midnight, would be 60 c. per lamp.

The contract would be for a term of three years, from the date of the installation of the lamps.

The Municipal Administration to provide and place at the disposal of the Société Générale d'Electricité, free of expense, the necessary sites and buildings for the fitting up of their steam-engines and electric machines. Subject to more complete investigation, these sites will be the following, among others:—A plot of unoccupied ground on the Boulevard Malesherbes, near the Madeleine (in a kiosk); in the subsoil of the Palais de la Bourse.

The Société Générale d'Electricité to be authorized to break up the public thoroughfares, and carry out whatever other works may be necessary for laying their conducting wires, at all times conforming to existing regulations. They are likewise to have permission, over the entire area of their lighting, to make, on the circuit formed by their conductors, any junctions or branch services, enabling them to supply one or more electric lamps in the houses of private persons who might be desirous of adopting that mode of illumination. In such case, the Société Générale d'Electricité would be willing, in order not to cause any diminution in the revenues of the Municipal Administration, to pay for each lamp thus supplied a sum equivalent to the loss the Administration would sustain by the suppression of a corresponding amount of gaslight.

The Société Générale d'Electricité would also undertake to bear, as far as might be deemed necessary, whatever expense might be incurred for workmen to re-light the gas, in the event of an extinction of the electric light taking place.

In the hope that these proposals will be accepted by the Municipal Administration, I beg you to receive the assurance of my most distinguished consideration.

The conclusions deducible from the foregoing proposal are the following:—

The number of electric lamps would be 171, and the cost of the light 171×60 c. = 102 frs. 60 c. (£4 2s.) per hour; or for a year of 2073 hours, reckoning the lighting to commence at dusk and continue till midnight, the cost would be—

	Frs. c.	Sterling.
$2037 \times 102{\cdot}60$ frs.	212,689 80	. . £8507 12
The cost of gas lighting is now per annum .	34,347 54	. . 1373 18
Difference.	178,342 26	. . £7133 14

There would, therefore, be an annual increase of expenditure of 178,342 frs. 26 c., produced by the adoption of the electric light, and the consideration of this additional expense has been the starting-point of our resolutions.

If, on the one hand, the City of Paris takes an interest in encouraging every fresh project, every new invention having reference to the public lighting, in the hope—probably chimerical—of arriving some day at a more perfect, and, at the same time, more economic system of illumination, it should not, to the detriment of its finances, extend beyond reasonable limits the trial of such system, especially in the form of paying for the lighting at a rate that would constitute it a positive subsidy to the new lighting companies coming into existence.

As far as regards more particularly the Jablochkoff Electric Light Company, they received, at starting, the very cordial support of the Municipal Council, as well as some substantial pecuniary assistance, inasmuch as the amount contributed by the City of Paris, in the shape of electric lighting experiments, carried on during a period of more than six months, has already reached a figure of over 60,000 frs. (£2400). Moreover, these experiments enabled the Company to show off before the whole world their new system of illumination, and thus benefit, to a certain extent, by the support, at once moral and pecuniary, accorded to them by the City.

Under these circumstances, is this an opportune moment to agree to the proposals of the Electric Light Company in their entirety? Your Committee think not. They consider that electric lighting is still only in the tentative period of its existence, and that a number of improvements will have to be effected in it, especially in the matter of regularity of working. The frequency of the extinctions and the length of their duration, together with the high price of the light, necessitate the maintenance of the gas lamps and fittings concurrently with all the apparatus used in connection with the employment of electricity, thus constituting a complication of apparatus, and, as a result, an increased expense.

Taking into consideration all these circumstances, your Committee have resolved, almost unanimously, to advise you that there are no grounds for entering into an agreement with the Electric Light Company, upon the bases and for the period named in their letter; but, having in view, at the same time, the advantage that would accrue to the City if facilities were afforded for ensuring the complete success of the new systems of electric lighting, and considering the special favour with which this method of illumination has been regarded by the Parisian public, your Committee think it their duty to recommend the continuation of the lighting, as an experiment, for a period of one year, from the 15th of January, on conditions to be hereafter specified.

On the other hand, it will have been noticed, from what precedes, that the Paris Gas Company appeared desirous of rivalling the Electric Light Company in effecting improvements in the public lighting—this being the main object your Committee, in the first instance, sought to attain, in deference to the frequently expressed wishes of the Municipal Council generally, and especially having regard to the admitted insufficiency of the lighting in the open spaces of the City. The position of the Gas Company in reference to this matter is a somewhat delicate one. An improvement in the public lighting which would necessitate an increased consumption of gas, would be at once a source of greater expense for the City and of clear profit for the Company. It will, therefore, be easily understood that the representatives of the latter, whatever desire they might have felt to do so, could not themselves become the promoters of such a measure. They therefore manifested a certain reserve in the matter, and confined themselves strictly to carrying out the conditions of their contract with the Municipality.

This is, in fact, how the case stands: The Municipality furnish the lamps and lighting apparatus, and the Gas Company supply the regulation quantity of gas to be consumed therein. As will be seen, the part taken by the Company is a purely passive one; they have no occasion to mix themselves up with questions of improvement in the mode of lighting. As, however, it is greatly to their interest that the City and the public

* The commutator is an appliance for causing the currents to pass successively into each of the candles in the electric lamp. As a candle does not last, on an average, longer than 1 hour and 40 minutes, the commutator is so arranged that a second candle is lighted when the first is exhausted. With four candles, therefore, the light in an electric lamp may be maintained for nearly seven hours, without requiring any attention from a workman.

* The number of lamps was increased subsequently to the despatch of the letter. It should be 171 instead of 156.

generally should use the article they have for sale, they are desirous of joining in any experiments tending to enhance the intrinsic value of gas. The Gas Company's representatives assured us that they had already specially studied this subject, and were, in fact, quite prepared to continue their experiments, even at some pecuniary sacrifice.

As it seemed from these declarations that the Gas Company hoped to be able to furnish, at a lower price, a light equal in brilliancy to that produced by the Jablochkoff candle, we were led to think that it would be advisable, in order to compare advantageously the two kinds of illumination, to select absolutely similar localities, and have them lighted by each of the competing systems.

Thus, as regards the public thoroughfares, as a parallel to the Avenue de l'Opéra, lighted by electricity, we should take the Rue du Quatre Septembre, to be lighted by means of improved gas-burners and lamps. For the public open spaces, the Place du Château d'Eau and the Place de la Bastille might be selected as being similar sites. Your Committee thought that it would be a good thing to have the electric light applied in some irregular localities, and therefore they have selected for this purpose the Place de la Bastille. *Per contra*, the improved system of gas lighting will be tried on the Place du Château d'Eau.

Following up this idea, it appeared to us desirable to apply the two modes of lighting in some covered public building, and for this purpose we have selected the Halles Centrales (the Central Market), where we propose that two similar pavilions shall be lighted—one by electricity, and the other by means of improved gas lighting apparatus.

Some of the members of your Committee were desirous of further extending these comparative trials. To compete with the electric lighting on the *façade* of the Chamber of Deputies, they wished to have the front of the Madeleine illuminated by means of rows of gas-jets, or by reflector-lamps; but the majority of your Committee refused to entertain this notion, and they have even decided to propose to you the discontinuance of the trial of the electric light on the *façade* of the Chamber of Deputies.

Consequently, you will authorize comparative trials of electric lighting and improved gas lighting to be made at the following places:—

Electric Lighting (Jablochkoff System)—

1. Avenue and Place de l'Opéra and Place du Théâtre Français.
2. Place de la Bastille.
3. One of the pavilions of the Halles Centrales.

Improved Gas Lighting—

1. Rue du Quatre Septembre.
2. Place du Château d'Eau.
3. One of the pavilions of the Halles Centrales.

It remains for us to determine on what conditions these trials are to be made, having in view the judicious employment of the finances of the City.

The price of 60 c. per hour proposed to be charged for each light by the Electric Light Company cannot but be regarded as somewhat high. Although it appears to be recognized that this is really by no means a remunerative price* the representatives of the city cannot possibly agree to it. It seems, however, to be equitable to offer to pay the Company for each electric lamp in proportion to the amount of light furnished by it, compared with that supplied by gas. Thus, as it has been proved that one electric light is equivalent to 11 gas-jets, it seems fair to pay 11 times the cost of one gas-jet per hour—that is, $11 \times 2{\cdot}1$ c.$= 23{\cdot}1$ c. (2·31d.); but, taking into account various matters which are difficult of estimation, it seems advisible to slightly increase this figure, and raise it to 30 c.

Your Committee, therefore, recommend you to authorize trials of electric lighting to be made in the previously cited places, at the price of 30 c. per lamp per hour. Further, instead of the lamps of an improved form that the Electric Light Company undertook to put up at their own expense, in the event of a concession of the lighting for three years being granted to them, we propose that you should simply authorize the fixing of temporary lighting apparatus, similar to those in the Avenue de l'Opéra, and even to use, as often as possible, the existing gas-lamps, making such alterations and additions as may be necessary, but without deteriorating their value. It is quite understood also that the Company will have to bear all the expense incidental to the re-lighting of the gas-lamps each night, at the time of the cessation of the electric lighting (midnight); or, in the event of an extinction taking place, during the whole period of such extinction.

Among the propositions made by the Electric Light Company, in the letter already referred to, there is one specially relating to the supply of electricity for the lighting of private establishments. This proposal your Committee recommend you to reject without consideration, it being most desirable to eliminate altogether every matter likely to give rise to unforeseen difficulties.

Briefly, these are the arrangements that would be adopted for the electric lighting:—

1. In the Avenue de l'Opéra and the two Places at either end, the existing lighting arrangements are to be preserved; there will consequently be 62 lamps, inclusive of the double lights in the Place de l'Opéra.
2. On the Place de la Bastille, 15 electric lamps are to be placed.
3. In the pavilion of the Halles Centrales, to be hereafter selected, five or six lamps are to be placed.

The additional annual expense that will result from the adoption of the electric light will be 34,044 fr. 48 c. (£1361 15s.) This sum has been ascertained from calculations set out in the following table:—

Places Lighted.	Proposed Electric Lighting. No. of Lights.	Price per Hour.	Total Cost per Hour.	Normal Lighting by Gas. No. of Burners.	Price per Hour.	Total Cost per Hour.
		c.	Fr. c.		c.	Fr. c.
Avenue de l'Opéra and adjacent Places.	62	30	18 60	344	2·1	7 22
Place de la Bastille .	15	30	4 50	101	2·1	2 12
Totals per hour. .	77	..	23 10	445	..	9 34
For one year, from dusk till midnight, being a total of 2073 hours	2073 × 23·10 = 47,886·30			2073 × 9·34 = 19,361 82 *		
Halles Centrales, one pavilion	6	c. 30	Fr. c. 1 80	20	c. 2 1	c. 42
For one year, the whole night through or a total of about 4000 hours . . .	4000 × 1·80 = 7·200			4000 × 0·42 = 1·680 †		

	Frs.	c.		£	s.	d.
* Increase of cost.	28,524	48	=	1141	0	0
† Ditto ditto	5,520	00	=	220	16	0
Total increase	34,044	48	=	1361	16	0

With regard to the improved gas lighting, the Director of Works, having consulted with the representatives of the Gas Company, has informed us as to the principal arrangements that will be adopted. They are as follows:—

1. In the Rue du Quatre Septembre the existing gas lighting apparatus will be utilized, to the number of 15, in the following manner:—The candelabras will have placed upon them gas-lamps of large size, and each candelabra will be furnished with a group of eight burners, consuming 1400 litres (50 cubic feet) of gas per hour.
2. On the Place du Château d'Eau there are at present 77 candelabras. Of this number 19 will be selected, at suitable points to be hereafter determined, and furnished with groups of eight burners. The 58 remaining lamps will be supplied with four-burner jets, consuming from 740 to 800 litres (26 to 28 cubic feet) per hour.
3. In the pavilion of the Halles Centrales to be selected, there will be placed 20 eight-burner lights.

The extra quantity of gas consumed may be estimated as follows:—

Places Lighted.	Proposed Lighting by Gas. No. of Burners.	Gas Consumed per Burner per Hour.	Total Hourly Consumption by Proposed Lighting.	Present Lighting by Gas. No. of Burners.	Gas Consumed per Burner per Hour.	Consumption per Hour for entire Lighting.
		Cub. Mèt.	Cub. Mèt.		Cub. Mèt.	Cub. Mèt.
Rue du Quatre Septembre . . .	15	1·400	21·000	15	0·140	2·100
Place du Château d'Eau. . . .	19 / 58	1·400 / 0·740	26·600 / 42·920	77	0·140	10·780
Totals per hour . .	..	..	90·520	..	..	12·880
For one year, from dusk till midnight, being a total of 2073 hours	2073 × 90·520 = 187,647·96			2073 × 12·880 = 26,700·24*		
Halles Centrales, one pavilion	20	1·400	28·000	20	0·140	2·80
For one year, the whole night through or a total of about 4000 hours . . .	4000 × 28·000 = 112,000			4000 × 2·80 = 11,200†		

	Cubic Mètres.			Cubic Feet.
* Increase of consumption	160,947·72		=	5,582,000
† Ditto ditto	100,800·00		=	3,558,000
Total increase	261,747·72		=	9,140,000

With regard to the price to be paid for the additional amount of gas consumed, we presume that the City will not be required, as the consequence of circumstances hereinbefore set forth, to pay for the extra gas consumed at the rate of 15 c. (1½d.) per cubic mètre (3s. 6d. per 1000 feet), which is the price fixed by the treaty with the Gas Company. Besides, the Company appeared to us to be disposed to admit that as soon as it became a question simply of making a comparative trial with other modes of lighting, they were in a position to make some concession on the price fixed by their contract. At all events, we consider that there are no grounds for paying, for any gas used in excess of the normal consumption, at a rate higher than 5 c. per cubic mètre (about 1d. per 1000). Consequently, the additional expenditure for gas will be 13,002 fr. 39 c.

The total additional expense to be incurred for these improvements in the public lighting during the year 1879 may, therefore, be estimated as follows:—

	Frs.	c.		Sterling.
For the electric light	34,044	48	..	£1361 16
For improved gas lighting	13,002	39	..	520 2
Total	47,046	87	..	£1881 18

Your Committee, therefore, recommend you to authorize this outlay, which will be charged to the working expenses for the year 1879.

The foregoing report came up for discussion in the Municipal Council at their meeting on the 14th inst., when the recommendations of the Committee as to the continuation of the electric lighting experiments, at the price of 30 c. per lamp per hour, and at a total outlay not to exceed

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* The net cost per hour has been ascertained in the following manner by M. Th. Lévy for the 62 lamps in the Avenue de l'Opéra:—

	Frs.	c.		Sterling.
Motive power	3	20	..	2s. 7d.
Coal for the steam-engine	6	64	..	5 4
Oil for lubrication	1	23	..	1 0
Attendance (per day).	3	20	..	2 7
62 candles, at 50 c. each.	31	00	..	25 0
Total	45	27	..	36s. 6d.

Or at the rate per hour for each lamp of 45·27 ÷ 62 = 73 c. (say 7|d.).

It will be seen, from these details, that if the Electric Light Company are able, as they hope, to reduce the motive power to 0·33-horse per lamp instead of 1·25, the power at present required, the outlay on that account will be reduced in a very considerable proportion, and the calculations of net cost will consequently be modified thus:—

				Frs.	c.		Sterling.
Motive power	3·20	× 33 ÷ 125	=	0	845	..	0s. 8·45d.
Coal	6·64	× 33 ÷ 125	=	1	753	..	1 5·53
Oil	1·23	× 33 ÷ 125	=	0	320	..	0 3·20
Attendance (no change)			=	3	200	..	2 7·00
Candles (no change)			=	31	000	..	25 0·00
Total				37	118	..	30s. 0·18d.

Or at the rate per hour for each lamp of 37·12 ÷ 62 = 60 c. (say 6d.).

It is well to come to an understanding as to what people have agreed to call a *remunerative price*. The expression is not a correct one, except on the condition of admitting the commercial value of the electric candle to be 50 c. (5d.) It is, however, quite certain that its real value, including the provision and working up of the raw material, the manufacture of the candle, its adjustment and fixing in the lamp, is very much below 50 c. But if we take 40 c.—and this is quite enough—as the actual value of the candle, the total of 37 frs. 12 c. is brought down to 12frs. 32 c., which gives 20 c. (2d.) as the real cost per hour.

35,000 frs. (£1400), were generally adopted. With regard to the improved system of gas illumination, the Gas Company having offered to supply gratis the excess of gas consumed in the course of the experiments, as well as the improved lamps and burners fitted up therefor, on condition that they should be reimbursed their value in the event of the improved system of lighting being definitely adopted, the Council consented to the proposition, and the recommendation of the Committee relative to the price to be paid for the extra gas was accordingly modified.

We purpose giving a report of the discussion in the next number.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Although a good demand is maintained in the coal trade of this district for house-fire classes of fuel, the recent advances are evidently only of a temporary character, as the market is very sensitive to any change in the weather, and the break-up of the frost last week at once had the effect of producing less firmness amongst sellers, who were asking the higher prices. So long, however, as the present severe weather continues, there is little doubt colliery proprietors will be able to obtain a slight advance upon late rates; and, as they are also clearing off a good deal of their stocks, they will be in a better position for keeping their pits going during the summer. In gas-making coals, deliveries on account of contracts continue to be pressed for; but there is little or no new business offering. The demand for common coal for steam and forge purposes continues very small, and so long as this class of fuel remains such a drug in the market, no permanent improvement in prices generally can be expected. Burgy and slack also still move off only slowly, and the last-named description of fuel, being more plentiful in the market, is rather weaker in price. The average quotations at the pit mouth are about as under:—Best Wigan Arley, 9s. 6d. to 10s.; common and second qualities, 7s. to 8s.; common house coal, 6s. to 6s. 6d.; steam and forge coal, 5s. 6d. to 6s.; burgy, 4s. to 4s. 6d.; and slack, 2s. 6d. to 3s. 6d. per ton.

In the shipping trade generally a better demand is still reported, with a slight stiffening in prices.

In the iron trade, although the business at present coming to hand continues extremely small, there seems to be a rather more hopeful feeling, and there are indications of a fair demand for iron for constructive purposes, as soon as the winter closes. Buyers would be willing to close for contracts over the year at present prices; but makers will not go beyond the first six months, except at a premium upon the rates now ruling in the market. This checks business for the present, and sellers who have to force sales for immediate delivery have to quote very low figures. The finished iron trade is without material change; but the works are kept going, as a fair warehouse business is being done in this district. Lancashire bars, delivered equal to Manchester, are quoted at £5 15s. to £5 17s. 6d. per ton.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England has kept fairly active during the past eight or ten days. The weather has placed no impediments in the way of shipments of gas coals, 87,582 tons of coals, mostly gas, being shipped from the Tyne Dock last week. They have been fully an average. Prices are about the same, and they are not likely to change much. There are various qualities of gas coals in the market. What bargaining there is, takes place amongst medium and second-class sorts. Best gas is pretty uniform in price. In this latter trade, whatever bargaining may occur, it is in matters of discount. Best house coals are firm in price; but there are coals on offer which are either household, gas, or steam, as required; and these are irregular in price. Very best house coals are about 11s. 6d. per ton free on board; a good medium quality is sold at 10s. 6d.; other sorts are offered at all prices. These kinds of coals, which were never intended for shipment when the pits were small, but for consumption at the iron-works and local factories, come into competition with steam, and they tend to pull the value of all sorts of coals down. Until there is a very great improvement in the local trade, there will be very little advance in price. The first half of 1879 will not see much change anyhow. That is very apparent.

There has been a pretty good demand for steam tonnage to load coals for London when they have been needed. Freights have ranged from 4s. 6d. to 4s. 9d. for handy boats, and from 6s. 3d. to 6s. 4½d. for small sailing ships; 6s. 6d. has been the rate paid to small ships to discharge at the wharves. Steamers have also been in request to load coals for the North of France at correspondingly advanced rates. The ice has cleared out of the rivers in the nearer ports of Europe to the extent, at any rate, of re-opening the navigation, and gas coals are now got away to the Continent pretty regularly again.

The general manufacturing trade of the North is unchanged. There is no demand for goods. There are few shipments, especially to the Continent. The home inquiry is likewise quiet. Chemicals are very low in price. Nothing is done except for immediate shipments. There are no transactions for forward delivery. The fire-brick and fire-clay goods trades are quiet. The agents of manufacturers are upon the Continent, soliciting orders.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

In his capacity of Manager of the Dumbarton Corporation Gas-Works, Mr. James M'Gilchrist has just issued a circular, chiefly for the benefit of those persons within the town who have not yet lighted their houses with coal gas. After speaking of the price, and the economical and other advantages resulting from the use of gas, Mr. M'Gilchrist goes on to remark upon the subject of consumers deposits. He says the Corporation have found by experience that without such deposits a considerable number of bad debts are incurred, which, of course, require to be made good by the consumers who pay their gas accounts regularly. To keep down bad debts, and ensure that all consumers pay for the gas they consume, deposits are charged from all persons wishing to be supplied with gas, at the following rates:—For a house of one apartment, 5s.; two apartments, 7s. 6d.; three apartments, 10s.; four apartments, 15s.; larger houses at corresponding rates; and the amount for shops and other places of business to cover four months consumption in winter. To show, he says, that the Corporation have no desire to make profit out of these deposits, they will give, from the 1st of January, 1879, interest at the rate of 5 per cent. per annum on all deposits lodged not less than two years, the interest being paid every three years. No persons wishing to pay their way can reasonably object to this deposit system, when they consider that it does away with bad debts, makes no respect of persons, and yields a good return for the money deposited; certainly a higher per centage than that given by any savings bank, and at least 1 per cent. higher than that at which the Corporation could borrow money. The circular concludes by remarking that by Act of Parliament the Corporation have power to take deposits without giving in return any interest for the money deposited, as is done in Glasgow and a large number of other towns.

It is proper that I should make a slight correction upon the remarks of the Provost of Falkirk, which I quoted in last week's "Notes." Mr. Scott, the new Manager, who was appointed some time ago, is responsible for the quality of the gas manufactured in that town, and not Mr. M'Gilchrist, who is only one of the new proprietors of the works.

There has been some more talk about the electric light during the past week. On Monday, the 13th inst., the subject was brought under the consideration of the Dunfermline Police Commissioners at their statutory quarterly meeting. Mr. Taylor moved the appointment of a committee to watch over the progress of the electric light, with a view to its adoption within the burgh, if it could be done with profit. He remarked that it had been extended to Glasgow, Edinburgh, and various other towns; but if he meant by that statement that the light had been adopted by the Municipal Authorities for public purposes, he was certainly a little wide of the truth. The motion was eventually agreed to, on the understanding the matter be considered by the Lighting Committee. On the same day the electric light was practically exhibited in Messrs. Garvie's works, Aberdeen, by a representative of the firm of Mawson and Swan, Newcastle-on-Tyne, and the experiments were witnessed by a large number of spectators. It is reported that the experiments were attended with a fair amount of success. A person, who is apparently a holder of gas shares, has been writing to one of the Glasgow papers, expressing an anxiety to know what the local gas officials have been doing in the way of testing the electric light, in order to see if they are satisfied that it cannot compete with gas. He remarks that large sums of money have been, and are invested in gas stock, and that surely this valuable property is not to be depreciated or lost without an effort being made to save it. While he has no fear himself of the present and future position of all gas companies, he thinks that shareholders ought to have some authoritative statement from head-quarters.

On Saturday week, the Glasgow Corporation Gas 9 per Cent. Annuities were raised £2, making £204, at which price business was done on Monday, the 13th inst., and at £205 on the following day, as also on Thursday and Friday. Edinburgh and Leith Gas Company's stock changed hands on Thursday and Friday at £29 10s. and £29 15s. respectively.

At the usual monthly meeting of the Rothesay Town Council, held last Monday, the Provost reported on behalf of the Water Committee that he and Bailie M'Ewen had had an interview in Edinburgh with Mr. Pitman, W.S. (Lord Bute's Commissioner), Mr. Cunningham, C.E., and Mr. Dickson, land valuator, with regard to the Dhu Loch supply. The terms were adjusted, and the rent to be charged by his lordship will be merely nominal, but as one of the farms may be deprived of water for its mill, a sum would have to be paid for compensation. The entire scheme, it is estimated, will cost £8000 to £10,000. The Council unanimously resolved to adopt the scheme for supplying the higher levels, appointed Mr. Cunningham as Engineer, but reserved judgment on the compensation for Kilmory farm loss of water. The works are to be proceeded with at once.

A report by Mr. J. M. Gale, Engineer to the Glasgow Water Commissioners, shows that for the past year the average daily consumption of water in the city was 35,800,000 gallons, being an increase, compared with the previous twelve months, of 2,100,000 gallons per day. It further stated that the whole of the new works, which had been in hand for about two years, many of them being of a somewhat important character, have now been completed. As registered by the 15 gauges kept in connection with the water-works, the rainfall had been considerably under the average of past years.

At the last meeting of the Town Council of Galashiels, it was reported that the estimated cost of the new water-works (now approaching completion) was £48,500, and it was proposed to make application for a further loan of £10,000 from the Public Works Loan Commissioners.

The Inverkeithing Town Council and Police Commissioners agreed to fall in with the scheme for getting a supply of water from the Dunfermline mains in connection with the Local Authority of Charlestown.

Of late there have been numerous complaints in St. Andrews regarding the deficient supply of water, and a number of ratepayers have appealed to the Board of Supervision to take up the matter. In consequence, an officer of that Board has lately been testing both the supply and the quality of the water.

The question of having proper schemes of water supply and drainage for the town of Annan has just been submitted to a *plébiscite* of the ratepayers, who have voted against, almost in the proportion of two to one. It is understood that the Police Commissioners will now leave the Board of Supervision to take what steps they may think necessary to effect an improvement in the sanitary condition of the burgh. The Board, some time ago, declared that they only refrained from harsh measures, because the Commissioners were taking action in the matter.

At the beginning of last week, the Glasgow pig iron warrant market was very flat, and prices receded to the lowest point touched during the last 26 years. A better feeling subsequently sprang up, and an advance of 6d. per ton was at one time established. The price receded again, and the market closed steady on Friday, at about 3d. per ton over the lowest, 42s. 5d. and 42s. 6½d., cash and one month respectively, being accepted on the afternoon of that day.

The coal market experienced no material change during the past week, the leading features being the same. House coal is in fair demand, but local trade continues restricted, owing to a good many works being now on short time. Prices of gas and common coal remain unaltered.

THE PLYMOUTH GAS COMPANY'S BILL.—The public meeting of owners and ratepayers of Plymouth, called under the provisions of the Borough Funds Act, was held on Monday, the 13th inst., when the resolution of the Town Council, to oppose the Gas Company's Bill, was confirmed, the costs to be charged on the borough rates. At the meeting, a letter from the Secretary of the Company (Mr. John Thomas) was read, which stated that if the Council will mention what alterations they desire in the Bill, the Directors will give the matter their immediate and careful attention; but they do not consider it advisable (as suggested at the Council meeting reported last week), without such information, to hold a conference with the Gas Committee of the Corporation.

THE GAS SUPPLY OF BARTON.—At a special meeting of the Barton Local Board on Dec. 8, the following resolution was agreed to :—"That the application of the Executors of the late James Chadwick, of Eccles, to be allowed to take up streets, &c., within the district of the Board, and to supply gas in competition with the Salford Gas Committee, be acceded to, and that such consent be given, subject to the following conditions—namely, that the gas to be supplied shall be made by the Executors within the district of the Board; that such Executors shall erect works and commence the manufacture of gas, in competition with the Salford Gas Committee, within two years from this date; that the Board reserve their right to manufacture and supply gas within their district, and the permission now given shall not preclude the Board at any time taking such steps to light the district as they may decide; that the Executors shall not charge more, per 1000 cubic feet, than the Salford Corporation may charge at a distance of four miles from their gas-works." This resolution was forwarded to the Solicitors of the Executors, and at the meeting of the

Board on the 6th inst., the Clerk read their reply, in which they stated that the main difficulty which presented itself to the Executors was the condition imposed by the Board, that they should not charge more, per 1000 cubic feet, than the Salford Corporation. It was quite impossible for their clients to estimate the exact cost of the gas, or to make any calculation which would enable them to become bound by such a condition. The Executors were not proposing to go into the matter merely from a spirit of competition with the Salford Corporation, but they believed they could supply gas of a better quality, and which would in the end be cheaper than that sold by the Salford Corporation. They thought the condition complained of might very properly be dispensed with. After some discussion it was agreed that the maximum price the Executors should be allowed to charge should be that charged by the Manchester Corporation to places four miles distant, and so the matter stands for the present.

Warrington Corporation Gas Supply.—At the monthly meeting of the Warrington Town Council, on Tuesday, the 7th inst., Alderman Hepherd, in moving the confirmation of the minutes of the Gas Committee, said he might congratulate the Council, notwithstanding everything which had been said, that during the year ending Dec. 31, 1878, the increase in the consumption of gas over the preceding year was 4,978,000 cubic feet, and he hoped these figures would satisfy those who had been of opinion that it was not necessary to extend the gas-works, for if an increase of nearly 5 million feet a year was to go on, as he had no doubt it would, he thought every one would consider that it was absolutely necessary that the Gas Committee should prepare for an extension of their works. The total make of gas in 1877 was 128,284,000 feet, and for the year ending the 31st of December last 133,262,000 feet. With reference to the quality of the gas, at the last meeting it was stated that the gas made since the works belonged to the Corporation was inferior to that made under the late Company. Feeling an inquiry should be made, he called upon Mr. James Paterson, the Engineer of the works, and he gave him the illuminating power for the twelve months before and the eight months since the works came into the hands of the Corporation. For the twelve months during which the works were managed by the Company it was 17·58 candles. The quality since the works had become the property of the Corporation was 18·70 candles, being more than one candle better, and that addition was equal to 2½d. per 1000 cubic feet upon the quantity sold; so that practically they had already decreased the price of gas in Warrington. The gas was two candles better in quality than that sold in York; and in London the average price was 3s. 8d., at a quality of from 15½ to 17 candles, neither figure being equal to what they produced in Warrington. He was glad to be in a position to say they would be able to make more gas still, if they had the capacity required for the distribution of it.

Register of New Patents.

3919.—Anderson, W., Erith, "*Improvements in the construction of ball and other taps.*" Provisional protection only obtained. Dated Oct. 23, 1878.

The chief object of this invention is to produce an efficient tap, applicable for the supply of water on the constant service system.

In constructing a ball-tap for cisterns, the slide-valve is employed in place of the conical plug, so arranging it, with respect to the supply and discharge, that there will always be a pressure of water upon the valve, tending to hold it down upon its seat. The valve will cover the opening of the discharge-pipe, and it will be cast with a recess on its under-side to receive the upper end of a rod lever, which is supported on a pivot-pin secured to the discharge-pipe. The lower end of this rod lever is fitted to receive the rod of the ball or float, the rising and falling of which in the cistern will open or close the valve.

The valve-seat is cast in one with the discharge-pipe or nozzle, which is flanged to provide for the fitting of the valve-box thereto by bolts and nuts. This valve-box is cast with a socket on its end, to receive the screwed end of the supply-pipe. So long, therefore, as the valve is closed, a pressure of water will be upon the valve, which will ensure the close fitting of the valve to its seat. There will, however, be no tendency for the valve to stick, but it will answer readily to the rise and fall of the float in the cistern.

In applying the invention to bib taps, the valve may be worked by a finger projecting from a horizontal spindle, mounted transversely to the tap and below the valve-seat. The outer end of this spindle may be fitted with a hand lever for giving a rocking motion to the finger, and thus opening or closing the valve. The valve may be made self-closing, by fitting this hand lever as a pendant weight. In this case, the maintaining of a discharge will necessitate the keeping of the handle in a raised position.

The means for working the slide-valve may be varied to suit varying circumstances, but in all cases it will be desirable to avoid the use of packing for the spindle used to transmit motion to the valve, by mounting the spindle below the valve-seat.

3922.—Dewrance, J., Great Dover Street, London, "*Improvements in cocks.*" Patent dated Oct. 23, 1877.

This invention relates especially to cocks which are kept tight by means of packing, and not by the accurate fitting of metallic surfaces. Such cocks are constructed with a cylindrical or parallel plug, and the shell of the cock is made with a corresponding cavity, which is closed at one end and open at the other to admit the plug. Near the open end, the cavity is enlarged, and adapted to receive a gland to compress the packing.

The packing employed is composed of asbestos; it is placed around the plug in the enlarged part of the cavity, also in grooves formed in the shell parallel to the axis of the plug, and on either side of, and at some distance from the water-way, and also between the end of the plug and the bottom of the cavity in the shell. The packing in the grooves is continuous with the packing at the end of the plug, and with that around it near its outer end, upon which the pressure of the gland is immediately exerted.

The gland also bears upon a shoulder on the plug, forcing it down, and compelling it to compress the packing resting upon the bottom of the cavity in the shell.

To reduce the area of the rubbing surface at the inner end of the plug, a cylindrical cavity is sometimes formed within it, and a corresponding projection is then made upon the bottom of the cavity in the shell, to enter the hole in the plug, and thus the packing at the end of the plug is confined to a comparatively narrow ring.

Sometimes the plug is turned down to form a shoulder where the packing comes into contact with it, and a gland is employed which is drawn up by side bolts. Lugs are formed upon the gland, corresponding to the packing grooves formed in the shell to compress the packing which these grooves contain.

For some descriptions of cocks the packing is placed on the plug instead of in the shell. Packing grooves are then formed in the plug, parallel with its axis, and on either side of the water-way, and the ends of the plug are roughened, so that when the plug is turned round within the cavity of the shell, it carries the whole of the packing with it.

3953.—Warner, W. J., South Shields, "*Improvements in machinery and apparatus for charging and discharging gas-retorts.*" Provisional protection only obtained. Dated Oct. 25, 1877.

This apparatus consists of a strong vertical quadrilateral frame mounted on wheels, and made to run on a longitudinal rail or tramway in front of the retort-benches, but below the floor line, the floor itself having a longitudinal opening to allow the frame to travel to and fro in front of the beds. The frame may be constructed independently of two steam or other lifts which it has to carry, or they may form a portion of the frame. The stroke or travel of the lifts has to be not less than the distance from centre to centre of the highest and lowest retorts. The top of the framing, therefore, will be about the floor level (to allow the lowest retorts to be worked, and the scoop and rake to move freely over the floor), and the bottom of the frame about the distance the lift has to descend below the floor.

Attached to the frame is a horizontal engine-driving a vertical shaft, for giving motion to the several portions of the machine—first, for propelling it to and fro in front of the beds; secondly, for actuating the scoop and rake attached severally to the two lifts; thirdly, for lifting the coal (from a trough in front of the store, and parallel to the opening for the frame to travel in), and throwing it along a spout, by means of a shovel arrangement to the back of the scoop, along which it is thrown by another shovel. The engine is also used to lift the coke in buckets from another parallel trough immediately in front of the beds, and pass the same along elevated gantries through openings in the side of the retort-house, this part of the arrangement and operation being similar to that described in the specification of letters patent, No. 2610, granted to the inventor, and dated July 22, 1875, with this exception, that the frame of the machine, which is entirely above the floor line, forms a tramway for the coke-buckets to travel over; but in the present plan, girders are fixed separately for each bed, both inside and outside the house. To the vertical frame is attached another frame, for carrying the gearing for actuating the shovels, and for carrying a platform (also guided and supported by wheels on a rail or rails) just clear of the retort-house floor. This frame also supports the winding gear for lifting and carrying the coke, and an arrangement for adjusting the spout shovel to the depth of coal, as well as the spout through which it is thrown.

From the vertical shaft of the engine, two hollow shafts are driven, square or slotted. These shafts are the length of the lifts, and are parallel to them, and are used for the purpose of actuating the rake and scoop, at whatever elevation they may be, by means of interior shafts, the two forming a telescopic or an expanding arrangement for conveying motion to the gearing.

The lift preferred to be used is a steam cylinder and piston, with suitable actuating gear. At the top of the piston-rod is fixed an arm for carrying one end of the shaft working in the socketed or hollow shaft; on this end is a pulley for conveying motion to a loose pulley on the piston-rod, and thence to a pulley fastened to the cradle for holding the scoop or rake, the object being to allow the cradle on the top of the piston-rod to move freely about it, that the scoop and rake may be the better adjusted to the irregularities in retorts caused by the heat, and that, too, without affecting the independent action of the scoop and rake. The cradle of the scoop is a cylinder, and may be made of sheet iron, or it may be made of rod or bar iron framed together. To this cradle is attached the gearing for communicating motion to the scoop. The scoop is much in the usual form, but it has no closed end. The back end or head is cylindrical, and round the outside edge is the periphery or teeth of a bevel wheel, the centre being removed to allow the coal to pass through. Geared to this bevel wheel is another, on the axis of which is a slotted arm forming a crank by taking hold of a pin fastened to an endless chain or band, which passes over a sheave or pulley at each end of the cradle, driven through the intervention of the hollow shaft and pulley. Thus it will be seen that a to-and-fro motion will be given to the scoop, thrusting it into, and then, through the intervention of the bevel wheels by the crank-pin passing over or round the pulley, an axial movement to the scoop will be given, the coals delivered into the retort, and the scoop withdrawn.

The action of the rake for drawing is in principle the same, being sent into the retort over the coke, and receiving an axial motion thrust into the coke, which by a return movement is withdrawn. There is this difference, however, between the two—the axial motion is independent of the reciprocating motion, and under the control of the workman, so as to draw any portion of the charge at will; but the whole charge may be drawn at once by the same means or by the same arrangement as for charging.

The rake and its shaft may be kept cool by a current of water being made to circulate through the same while in action, by connecting them with a small reservoir of water for simple circulation through a concentric or double tubular shaft; or water may be forced through the same by a small pump; or the rake and rod may be cooled as withdrawn, by forcing a stream of water over the same. The exhaust steam may be used for this purpose.

The machine may be worked by any kind of motive power, but steam is preferred; and it is also preferred to convey the steam to the machine from a fixed boiler by means of flexible tubes attached to valvular connections, such as the stand-pipe valve described in the specification of a patent granted to the present inventor (No. 751, dated Feb. 23, 1876), or the steam connection may be made by means of a flexible tube wound round a horizontal drum attached to the machine, or the drum may be placed at one end of the building, and the loose end of the tube attached to the machine. The tube may be placed in the longitudinal opening in the retort-house floor along which the machine travels. This opening may be closed by gratings or hinged flaps to be opened and closed by the machines as it travels along in front of the beds of retorts.

The openings from the coal store into the trough for feeding it with coal are to be regulated by gates or adjustable doors. Instead of feeding the scoop through the rear end of it, a supplementary scoop or charger may be employed for filling the scoop, being swung round over it for discharging the contents into the scoop.

The coal may be raised by shovel pans attached to an endless chain or band, or by the ordinary buckets of a "Jacob's ladder." When the scoops are charged by shovels, as first described, the coal may be made to take its proper position in the scoop, to suit the varying requirements of the retorts, by stops or guides.

The lifts may be placed on rails above the retorts, with their pistons working downwards instead of upwards, when placed under the floor.

3956.—Johnson, J. H., Lincoln's Inn Fields, London, "*Improvements in hydrants.*" A communication. Patent dated Oct. 25, 1877.

This invention relates to hydrants for the supply of water for watering streets, or for fire-engines or other like purposes, and it consists partly in providing the hydrant with two valves, an upper and a lower, the upper one of which forms the normal cut-off valve, and is opened and closed by means of a spindle, whilst the other, which is self-acting, is employed as the cut-off valve when the former valve is required to be taken out of the hydrant-box, in order to admit of repairs being effected, or of the washers

of leather or rubber being renewed without closing the valve of the main-pipe.

By a peculiar arrangement and form of the valves, any shock or concussion of the water is prevented during the action of closing the hydrant, the valves being made of such a shape that the aperture of the valve is gradually opened, in lieu of the whole section of the aperture being opened suddenly when the hydrant is operated.

APPLICATIONS FOR LETTERS PATENT.

98.—Hughes, E. T., Chancery Lane, London, "Improvements in lamp-burners." A communication. Jan. 9, 1879.

105.—Deacon, G. F., Liverpool, "Improvements in apparatus for measuring the flow of water in pipes." Jan. 10, 1879.

113.—Wentworth, S. W., South Hackney, London, "Improvements in portable gas apparatus for heating water or other liquids for baths and other purposes." Jan. 10, 1879.

142.—Cutler, S., Millwall, London, "Improvements in gas purifier grids or sieves." Jan. 13, 1879.

144.—Morgan-Brown, W., Southampton Buildings, London, "Improvements in the production of electric light, as well as in the materials and mechanism employed for that purpose." A communication. (Complete specification.) Jan. 13, 1879.

152.—Imray, J., Southampton Buildings, London, "Improved means and apparatus for carburetting gas or air, and purifying the carburetted fluid for purposes of illumination." A communication. Jan. 14, 1879.

154.—Davis, F. N., Beloit, U.S.A., "Improvements in pumps." Jan. 14, 1879.

166.—Lake, W. R., Southampton Buildings, London, "Improvements in water-meters, which improvements are also partly applicable to pumps and motor-engines." A communication. Jan. 15, 1879.

167.—Lake, W. R., Southampton Buildings, London, "Improvements in pumps." A communication. Jan. 15, 1879.

171.—Warner, R. G., Jewin Crescent, London, "Improvements in cocks or valves, and apparatus for drawing off regulated quantities of liquid." Jan. 15, 1879.

174.—Voice, E. L., Torrington Square, London, "Improvements in apparatus for controlling, regulating, measuring, and arresting the flow or discharge of liquids and fluids, and preventing waste thereof." Jan. 15, 1879.

178.—Meritens, A. de, Paris, "Improved means for obtaining light by electricity." Jan. 15, 1879.

192.—Remington, G., Shepherd's Bush, London, "An improved method of and apparatus for preventing rapid combustion or destruction of the electrodes used in electric lighting." Jan. 16, 1879.

193.—Lake, W. R., Southampton Buildings, London, "An improved fluid pressure regulator, chiefly designed for controlling the supply of water for domestic and similar purposes." A communication. Jan. 16, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2820.—Powers, A., Birmingham, "New or improved additions to chandeliers, lamps, brackets, sconces, candlesticks, and similar articles used for lighting and illuminating purposes." July 15, 1878.

2826.—Carter, J., Eaton Square, London, "Improvements in and relating to closed cisterns or tanks for containing water or other liquids." July 15, 1878.

2893.—Thompson, W. P., Liverpool, "Improvements in the generation and production of gas for lighting, heating, and other purposes, and in apparatus therefor." A communication. July 20, 1878.

2941.—Ravenor, R., Berks, "Improvements in apparatus or appliances for attaching service-pipes to water, gas, or other mains while under pressure." July 24, 1878.

4226.—Edison, T. A., New Jersey, U.S.A., "Improvements in the method of and means for developing electric currents, and lighting by electricity." Oct. 23, 1878.

4575.—Tyler, H. W., Colchester, Essex, "Improvements in the means or apparatus for electric lighting." Nov. 12, 1878.

4585.—Haddan, H. J., Westminster, "Improvements in purifying and increasing the light power of illuminating gas." A communication. Nov. 12, 1878.

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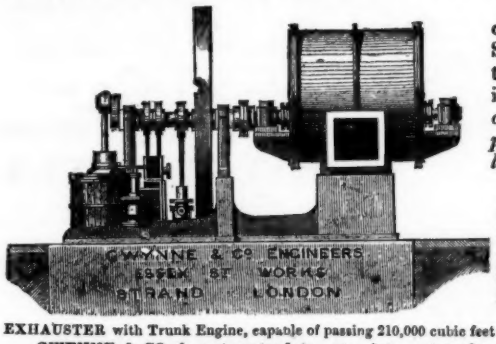

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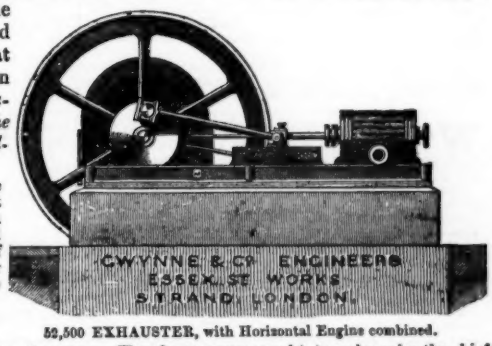

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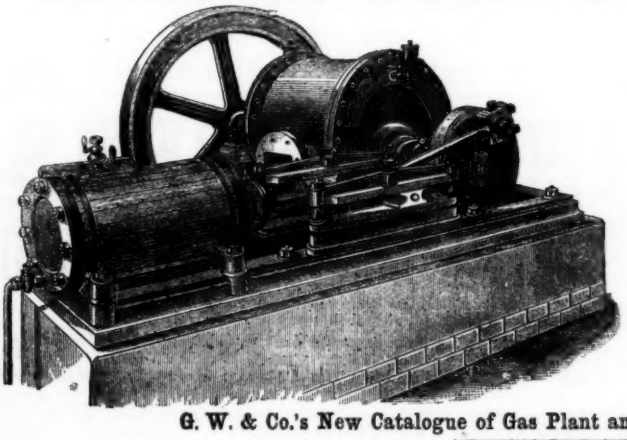

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For any further information apply to Mr. BOWER, Gas-Works, Lytham, LANCASHIRE.

GASHOLDER.

TENDERS required by the South Aus- tralian Gas Company for a TELESCOPIC GASHOLDER, 150 ft. in diameter, in two lifts, of 30 ft. each.

Plans and specifications (One Guinea per set) can be had on and after the 20th inst., on application to the Company's Agent, J. C. LANYON, 27, Gresham House, Old Broad Street, LONDON, E.C.

TO FOREMEN TAR DISTILLERS.

AN active intelligent Working Foreman required for small factory in the Provinces; with knowledge of Ammonia preferred.

Apply, by letter, with particulars and references, to No. 518, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR AND AMMONIACAL WATER.

THE Lymm Local Board are prepared to receive TENDERS for the Surplus TAR and the whole of the AMMONIACAL WATER made at their Gas-Works during the next One, Two, or Three years.

Tenders to be sent in to the undersigned on or before the 1st day of February next.

The Board do not bind themselves to accept the lowest or any tender.

T. J. RIDGWAY, Clerk to the Local Board.

Lymm, Jan. 20, 1879.

TO BUILDERS AND GASHOLDER MAKERS.

THE Directors of the Chertsey Gas Con- sumers Company, Limited, invite TENDERS and SPECIFICATIONS for a TELESCOPIC GASHOLDER; also a Brick Tank for the same. The inner lift of holder to be 52 ft. over by 10 ft. deep, and similar to the holder at present in use by the above Company.

The lowest or any tender not necessarily accepted.

Tenders to be sent in by the 1st of February next, to

JOHN MOIR, Secretary.

FOR SALE.

THE Bury St. Edmund's Gas Company, being about to increase their purifying power, have FOR SALE a Set of Four PURIFIERS, each 8 ft. square by 4 ft. deep, with Hydraulic Centre-Valve, Connecting Pipes, Covers, and Lifting Screws, all complete, and in good working order.

May be seen at work, and all particulars learned, on application to the undersigned.

JOHN M'CRAE, Engineer and Manager.

TO GAS COMPANIES.

THE Gas Committee of the Blackburn Corporation are prepared to receive OFFERS for a TELESCOPIC GASHOLDER, 60 ft. in diameter, and Two 20 ft. LIFTS; also Cast-Iron TANK for the same 61 ft. 6 in. in diameter and 20 ft. deep, with all Pillars, Girders, Inlet, and Outlet, all complete.

Can be seen working, and all information required can be obtained, on application to the undersigned.

SAMUEL R. ODDEN, Engineer.

Gas-Works, Blackburn.

AMMONIACAL LIQUOR.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for the whole of the AMMONIACAL LIQUOR produced at their Works for One year from the 25th of March next.

Contractors to state price at per 1000 gallons of 6 degrees Twaddel, delivered into tank at the Company's Works; and sealed tenders, endorsed "Tender for Ammoniacal Liquor," to be sent to me, the undersigned, on or before Monday, the 17th day of February next.

The Directors do not bind themselves to accept the highest or any tender. By order,

W. A. PADFIELD, Secretary.

Gaslight Offices, Exeter, Jan. 9, 1879.

AMMONIACAL LIQUOR.

SPENCE and STEUART, Frizinghall, near Shipley, YORKSHIRE, are Purchasers of above.

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PATENT COKE AND COAL BARROW

Is acknowledged to be the best Barrow in the Market.

For particulars, with Drawings and Prices, apply to the Sole Makers,

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TO BE SOLD BY TENDER, a quantity of GAS PLANT suitable for a medium-sized Gas-Works, consisting of a 30 ft. Gasholder, together with one Station-Meter. Capacity, 5000 ft. per hour, with three 8-in. Valves and connections complete.

Set of Six PURIFIERS, 9 ft. by 6 ft., and 3 ft. 6 in. deep, with Trays and two Centre Valves complete. Two Columns, two Guides, and frame belonging thereto.

One SCRUBBER, 8 ft. by 7 ft., with Iron Trays, Centre Table, and other necessary connections.

One 8-in. GOVERNOR, and also a quantity of piping and other miscellaneous articles.

The above are to be disposed of in consequence of recent extension and enlargement of the works.

Tenders to be sent addressed to the Secretary, and the Directors do not pledge themselves to accept the lowest or any tender

For further particulars apply to Mr. John Perry, Manager, or to

W. H. DAVIES, Solicitor, Secretary.

PATENT AGENCY.

WHEREAS I, the undersigned, am the Patentee of an Invention for "Improvements in Furnaces for the Manufacture of Illuminating Gas, partly applicable to Furnaces for Heating Purposes generally," and by virtue of Letters Patent, dated the 19th day of June, 1877, the power of vending and exercising the said Invention in Great Britain is vested in me.

And whereas it has come to my knowledge that a certain person or persons are representing themselves to be my Agents for the Sale of the said Invention in the United Kingdom.

Now I do hereby give notice that I have appointed as my Sole Agents for the Sale of the Said Invention in the United Kingdom of Great Britain and Ireland, Messrs. G. E. Stevenson, of the City of Peterborough, in the County of Northampton, Civil Engineer, and Manager of the Peterborough Gas-Works, and Julius Von Quaglio, of 34, Grove Place, Brompton Road, London, Engineer; and that no other person or persons have any authority from me to contract for the sale of the said Invention or otherwise intermeddle therewith; and if, after the date of this notice, any negotiations with regard to the said Invention, and the Sale thereof, are carried on, except through the said G. E. Stevenson and J. Von Quaglio, the party or parties so offending will be proceeded against as the law directs.

Dated this 14th day of January, 1879.

GEORG LIEBEL, Gas Director.

Stralsund, Germany.

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Improved Wet and Dry Gas-Meters,

ALSO PATENTEES OF

COMPENSATING WET METERS ;

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WORKS: WATERBEER ST., EXETER.

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By THOMAS NEWBIGGING, M.I.C.E.

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MANUFACTURED BY

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The Gaslight and Coke Company, of London, finding this arrangement so perfect and reliable under the lengthened tests of real work, have, DURING TWO YEARS just past, had UPWARDS OF EIGHT HUNDRED Wet Meters, supplied by other parties, altered by The Imperial Meter Company, to their Patent Compensating principle.

The Water Reservoir for compensation will, under ordinary conditions, without attention, keep the Meter working for Ten to Twelve Months with an Unvarying Water-line.

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HENRY LYON (14 years Engineer and Manager of the largest of the Manchester Corporation Gas-Works) Mechanical and Consulting Gas Engineer, reports upon the condition and value of Gas-Works, supplies plans and specifications of all Apparatus appertaining to Gas-Works, and re-models existing Works.
Address Brooklyn, near Halliwell Lane, Cheetham Hill Road, MANCHESTER.

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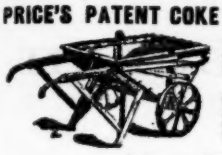

effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.
Prices are Reduced.

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Public Accountant,
MOORGATE STREET CHAMBERS,
GREAT SWAN ALLEY,
MOORGATE STREET, E.C.

Mr. ROBERT DEMPSTER,
CONSULTING GAS ENGINEER,
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May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

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FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.
A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
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THE FIRST VOLUME
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BEG TO CALL THE ATTENTION OF GAS ENGINEERS TO THEIR

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METALLIC NEEDLE GOVERNOR

FOR

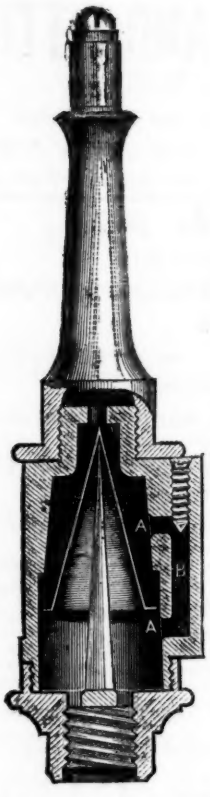
PUBLIC LAMPS, STAIR-LIGHTS, RAILWAY STATIONS, HOTELS, CHURCHES, HALLS,

AND ALL PLACES WHERE AN UNVARYING CONSUMPTION OF GAS IS REQUIRED.

From Dr. Wm. Wallace, F.R.S.E., F.C.S., Gas Examiner for the City of Glasgow:—

"*Glasgow, July* 11, 1878.

"Many thanks for the Governor. I think you may say, '*Eureka!*' for this is the thing we have all been searching for; but hitherto without success."



At the meeting of the North British Association of Gas Managers at St. Andrews, July, 1878, Wm. Young, Esq., Clippens, said:

"I submitted the instrument to the most severe tests, and, do my best, I could not get it to vary, either with or without the burner. I am thoroughly convinced that the principle on which this instrument is constructed is the most perfect principle possible."—*See* Journal of Gas Lighting, *Aug.* 13, 1878.

These Governors are made of incorrodible materials, are easy of adjustment, can be readily taken to pieces and cleaned when necessary, and are of small diameter. They are already in extensive use, and have merited the approval of many leading Gas Engineers. For Gas Companies abroad in hot climates they will prove invaluable, as the parts, being metallic, are indestructible, and proof against any ordinary temperature.

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Prices on application.

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Our opinions (which we know to be very generally entertained) as to the impossibility of making the DRY METER as reliable in measurement as the WET, have never for a moment caused the relaxation of our efforts to make it as perfect as its principle admits. That the DRY METER possesses *some* advantages, cannot be denied; but these being only obtained by the sacrifice of others still greater, we need not wonder that even the temporary freezing of a Wet Meter is not, in the great majority of cases, considered a sufficient reason for replacing it with a Dry.

Dry Meters may be made, and by us are constantly made, to "register correctly," and in this we are not surpassed by any other firm. But who would be bold enough to say of a Dry Meter, as he might safely say of a Warner and Cowan Wet, that it will continue to register with the same accuracy so long as it registers at all? Of no other Wet Meter can this be truly said, and certainly of no Dry Meter, however "properly made."

The freezing of a Wet Meter is, of course, inconvenient; but it depends upon circumstances over which there would be perfect control, if the necessary effort were made. In most instances, freezing might be entirely prevented by changing the position of the meter; and, in those cases where this cannot be done, an addition of glycerine to the water would prevent its necessity, and the effects of frost, as it is found to do in Countries where the winters are longer and more severe than in the United Kingdom. It is, perhaps, not surprising that the advocates and makers of Dry Meters only (who conveniently ignore the fact that frozen "Dry" Meters are by no means uncommon) should utilize the severity of the present season to disparage the Wet Meter, by pointing out its liability to freeze; but it would be a wonder indeed if those who know the superiority of Wet Meters generally, and more especially the Warner and Cowan, as measurers of gas, were to be induced to sacrifice advantages so solid as these latter offer, on account of certain inconveniences which only occasionally occur, and may with proper care be entirely avoided.

The "freezing of Wet Meters," like the "jumping lights," also unjustly charged against them, are both equally preventible; and it is desirable that those evils should be remedied, not by the adoption of meters in which the measuring element is less reliable, but by the correction of those circumstances which produce them.

W. & B. COWAN,
WET & DRY GAS-METER MANUFACTURERS,
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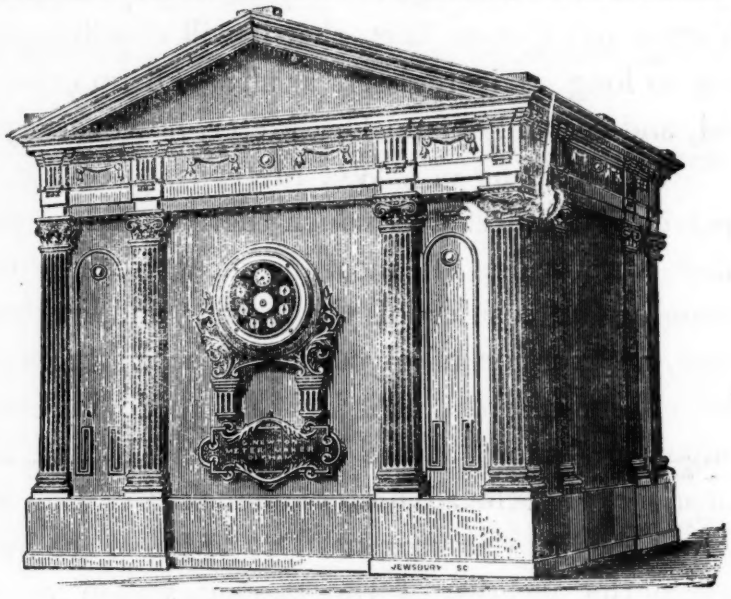

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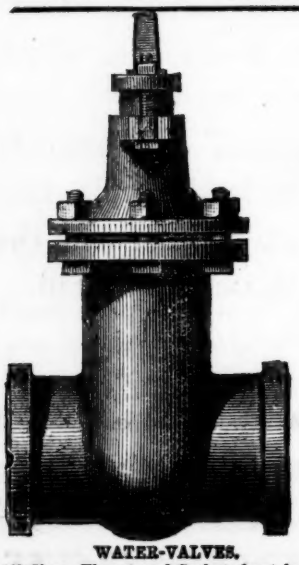

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And all other Machinery for
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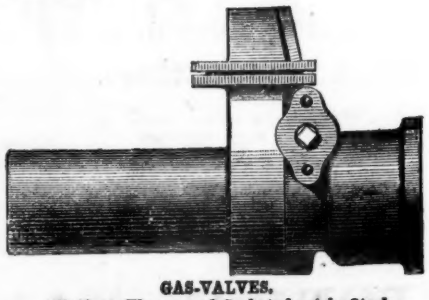

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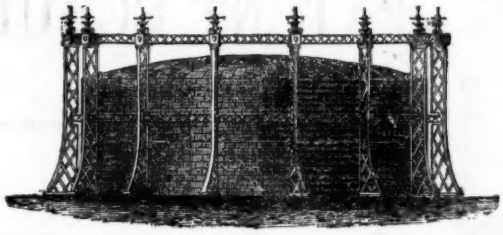

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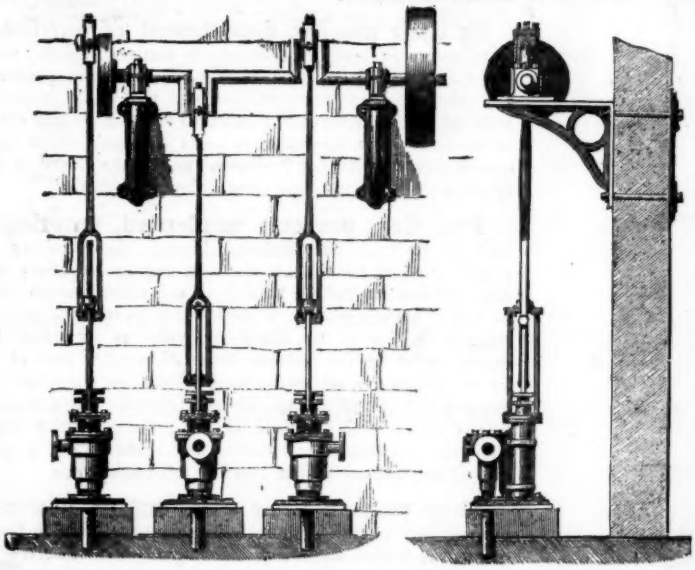

IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This Illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

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By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

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